PLANT BREEDING ABSTRACTS

Vol. XXVII, No. 2
(Abstracts Nos 974—2432)

Compiled from World Literature
by the

COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS

1 April, 1957

Commonwealth Agricultural Bureaux,
Farnham Royal, England

TABLE OF CONTENTS

PAGE

Statistics 177

Genetics 180

Evolution 197

Cytology 198

Economic Lower Plants (*Laminaria*, *Penicillium*, yeasts) 205

Crop Plants (including annual reports) .. 207

Cereals 259

Wheat 262

Buckwheat 276

Oats 276

Rye 279

Maize 281

Barley 291

Millets and Sorghums 298

Rice 301

Forage Grasses (including general studies of forage plants) 302

Leguminous Forage Plants 310

Roots and Tubers
- Beet 314
- Turnip 314
- Potato 314
- Sweet Potato 319

Fibres
- Cotton 320
- Flax 328
- Hemp 329
- Jute 330
- Kenaf 330
- *Broussonetia* 330
- Willow 330

Sugar and Starch Plants
- Sugar Cane 330
- Sweet Sorghum 338
- Sugar Beet 338

Stimulants
- Tobacco 341
- Tea 342
- Coffee 342

PAGE

Stimulants—*continued*
- Cacao 344
- Poppy 344
- Hops 345

Minor Crop Plants (*Capsicum*, rape, castor oil plant, sesame, linseed, sunflower, safflower, oil palm, wattle, rubber, *Chrysanthemum*) 346

Fruits and Nuts 350
- Pome Fruits 350
- Stone Fruits 353
- Citrus Fruits 355
- Fig 355
- Mango 355
- Nuts 355
- Groundnut 356
- Coconut 357
- Olive 357
- *Carica* 357
- Avocado 357
- Soft fruits 358
- Banana 360
- Grape 360

Forest Trees 363

Vegetables 374
- Carrot 375
- Radish 375
- Jerusalem Artichoke 375
- *Allium* 376
- Asparagus 376
- *Brassica* 377
- Spinach 379
- Lettuce 379
- Endive 380
- Cucurbits 380
- Tomato 382
- Okra 385
- *Vicia* 385
- *Phaseolus* 386
- *Vigna* 387
- Soya bean 387
- Pea 387
- *Cicer* 388
- *Cajanus* 388
- Sweet corn 388
- Popcorn 389
- Mint 389

Book Reviews 390

New Journals 401

C. A. B.
2 APR 1957

Plant Breeding Abstracts

Vol. XXVII, No. 2

STATISTICS

974 BEHRENS, W. U.
Die Gültigkeit des t-Testes. **(The validity of the t test).**
Z. Pflanzenz. 1956 : **36** : 214–27.

Sets of yield data are discussed in which conflicting conclusions regarding the significance of yield differences arose from the use of the *t* test. Conditions to be fulfilled before the results of the *t* test can be considered reliable are then discussed and the test is compared with other methods, including the *F* test (cf. *PBA*,† XXVI, Abst. 800) and the Studentized range test (cf. *PBA*, XXIII, Abst. 3). The use of a combination of the *F* and *t* tests and the application of the Studentized range test are not recommended for variety trials as the amount of information lost is too great.

975 LEANDER, K. & FINNEY, D. J.
An extension of the use of the χ^2-test.
Appl. Statist. 1956 : **5** : 132–36.

A random variable has a Poisson distribution with mean μ before, and mean $p\mu$ after, a treatment has been applied. p and μ depend on the person applying the treatment. A significance test is developed for investigating differences between the values of p for different persons. An example illustrates the method.

976 BLISS, C. I., COCHRAN, W. G. & TUKEY, J. W.
A rejection criterion based upon the range.
Biometrika 1956 : **43** : 418–22.

An objective rule is proposed for deciding whether or not to reject an aberrant observation when k samples each of size n, with equal population variances but possibly different means, are available. Tables are given for $n = 2(1)10$ and $k = 2(1)10$, 12, 15, 20, 50. Interpolation for k is possible.

977 RADHAKRISHNA RAO, C. & CHAKRAVARTI I. M.
Some small sample tests of significance for a Poisson distribution.
Biometrics 1956 : **12** : 264–82.

The following problems are discussed with the emphasis on small samples: homogeneity tests for the Poisson distribution, i.e. tests for whether several samples can have arisen from populations with the same parameter, by means of Fisher's coefficient of dispersion* and the likelihood ratio principle*; and tests for deviations in the zero frequency by components of χ^2, likelihood ratio methods and exact tests using classical occupancy methods*. Extensions of large-sample results for the last method to any linear combination of frequencies are given. Truncated Poisson and binomial distributions are also briefly considered. Tables are given for tests marked*, and for a goodness of fit test using the likelihood ratio principle, in all cases for $T = 3(1)10$ and $f = 3(1)10(10)100$; f is the number of observations and T is their grand total. Several illustrative examples are included.

978 KRAMER; C. Y.
Extension of multiple range tests to group means with unequal numbers of replications.
Biometrics 1956 : **12** : 307–10.

A possible extension of Duncan's multiple range tests to the situation of the title is given.

979 LEWONTIN, R. C. & PROUT, T.
Estimation of the number of different classes in a population.
Biometrics 1956 : **12** : 211–23.

A population contains n classes equally represented. In a sample k classes are observed. In the first part the authors discuss the estimation of n from the sample by maximum likelihood, and determine the asymptotic variance of the estimate. In the second part these results are applied to the estimation of the number of loci on a chromosome using lethal-mutation investigations either in a complete or a random cross. The efficiency of an estimate proposed by Wright and Dobzhansky is determined in the case of a random cross. Confidence interval estimation is discussed. Two examples with *Drosophila* are given.

980 NORTON, H. W.
One likelihood adjustment may be inadequate.
Biometrics 1956 : **12** : 79–81.

It is pointed out that the iterative method of Fisher for the solution of maximum likelihood equations may, contrary to Fisher's statement, require more than one iteration. A problem of estimation of cross-over frequency in genetics is used as an illustration.

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† *Plant Breeding Abstracts.*

981 Breese, E. L.
The genetical consequences of assortative mating.
Heredity 1956 : **10** : 323–43.

The possible consequences of a system of assortative mating in quantitative inheritance are considered, for situations involving differing conditions of dominance, and its possible use as a technique in breeding is discussed. Experiments with *Nicotiana rustica*, comparing the effects of assortative mating (A), selfing (F) and random mating (R), have shown a significant increase in the genetic variability of family means under A as compared with R systems of mating, but the greatest genetic variation was found in F progenies. The extent of the increase in genetic variability of A family means depends on (1) the phenotypic correlation achieved between parents, (2) the degree to which genic expression is affected by environmental fluctuations and (3) the complexity of the genetic control of the character. If the number of genes involved is large, the increased variance depends on a reassociation of genes such that an excess of combinations giving extreme expression is achieved at the expense of the more balanced combinations, leading, where dominance is absent, to homozygosis of reinforcing genic combinations and fixation of extreme expressions. With more complex genetic situations involving dominance, genic interaction and linkage, this process may be retarded. Assortative mating is seen to have two functions in evolution: (1) causing divergence within a population resulting in extreme cases in speciation and (2) as a process whereby internal chromosome balance may become established, allowing the development of inbreeding systems.

982 Conagin, A.
Láttices retangulares. (**Rectangular lattices**).
Bragantia 1954 : **13** : 187–97.

The advantage of the rectangular lattice design for plant breeding and genetical experiments is explained by means of examples.

983 Morrison, M.
Fractional replication for mixed series.
Biometrics 1956 : **12** : 1–19.

A method is given for constructing fractional replicates when the factors occur at different numbers of levels. The method is simple and exemplified by half-replicate designs for $2^4 \times 3$, $2^4 \times 4$ and $2^3 \times 3 \times 5$. In these cases it is not necessary to assume that two-factor interactions are zero. The estimation procedure is illustrated in the $2^4 \times 4$ case, and the analysis of variance procedure in the $2^4 \times 4$ and $2^4 \times 3$ cases.

984 Debaun, R. M.
Block effects in the determination of optimum conditions.
Biometrics 1956 : **12** : 20–22.

A refinement in the techniques of Box and Wilson for the attainment of optimum conditions is discussed (cf. *PBA*, XXII, Abst. 2369).

985 Truitt, J. T. & Smith, H. F.
Adjustment by covariance and consequent tests of significance in split-plot experiments.
Biometrics 1956 : **12** : 23–39.

An account is given of methods for adjusting experimental data by covariance on a concomitant variable, and of appropriate ensuing tests of significance, when, as in a split-plot experiment, the analysis has two or more rows for errors at different levels. It is assumed that the regressions appropriate to main-plot and sub-plot comparisons are equal, but it is pointed out that the assumption is often not justified. The effect of missing subplots is considered. Three numerical examples are included.

986 Finney, D. J.
Multivariate analysis and agricultural experiments.
Biometrics 1956 : **12** : 67–71.

A criticism of some applications of multivariate methods in the analysis of agricultural experiments is made, with particular reference to the work of Steel (cf. *PBA*, XXVI, Abst. 809).

987 Hartley, H. O.
A plan for programming analysis of variance for general purpose computers.
Biometrics 1956 : **12** : 110–22.

An attempt is made to evolve a standard programme for a computer that will deal with most balanced analyses of variance, thus avoiding a special programme for each design. A factorial experiment is first discussed and it is shown how the analysis of other designs may be reduced to this case. Missing plot techniques are mentioned. The programme is considerably simpler than that corresponding to the general least-squares analysis. (Cf. Abst. 994).

988 THOMPSON, H. R.
Extensions to missing plot techniques.
Biometrics 1956 : **12** : 241–44.

A technique is given which permits the simultaneous estimation of missing observations in a randomized-block experiment with r blocks and t treatments, for the special case when there is one missing observation in each of n treatments ($n \leqslant t$) distributed over p blocks. The roles of blocks and treatments may be interchanged.

989 CLARINGBOLD, P. J.
A note on the 4^n series of factorial experiments.
Biometrics 1956 : **12** : 259–63.

An example is given of a quarter-replicate of a 4^5 experiment, together with some general remarks on the 4^n series.

990 RAY, W. D.
Sequential analysis applied to certain experimental designs in the analysis of variance.
Biometrika 1956 : **43** : 388–403.

Two situations are considered. The first is one-way classification into k groups. The sequential procedure consists in taking an equal number of observations from each group at each stage of the experiment, and proceeding until certain limits are reached which enable one to decide whether or not any differences exist between the groups. Tables are given for k up to 10 for a restricted range of alternative hypotheses. In the second situation, randomized blocks with n varieties are considered. The sequential procedure is to take one block at a time until a decision about differences between the varieties can be made. Tables are given for n up to 8 and a restricted range of alternative hypotheses. In both cases some conjectures are made about the expected sample sizes. The paper should permit sequential methods to be used in a few simple experimental designs.

991 CONAGIN, A.
Aplicações dos experimentos fatoriais nas pesquisas de laboratório. (**Applications of factorial experiments in laboratory investigations**).
Rev. Agric., S. Paulo 1956 : **31** : 235–48.

The principles of factorial designs are explained, together with the use of confounding and fractional replication.

992 FINNEY, D. J.
The statistician and the planning of field experiments.
J. R. statist. Soc.: Ser. A : 1956 : **119** : 1–27.

The following topics are discussed in general terms: statistics and scientific research, pilot experiments, selection of treatments and plots, replication, amount of experimentation, recording of results, analysis and interpretation, and groups of experiments.

993 WRIGHT, G. M.
Missing values in factorial experiments.
Nature, Lond. 1956 : **178** : p. 1481.

A general formula for estimating missing values in factorial experiments is derived. The estimate is identical with that obtained by equating to zero the component which measures the interaction of the comparisons of the level of each factor in which there is a missing value with all other levels of the factor.

994 HEALY, M. & WESTMACOTT, M.
Missing values in experiments analysed on automatic computers.
Appl. Statist. 1956 : **5** : 203–06.

A general technique is given for dealing with observations missing from block experiments analysed on automatic computers. It is applicable to any least-squares analysis. (Cf. Abst. 987).

995 GRUNDY, P. M., HEALY, M. J. R. & REES, D. H.
Economic choice of the amount of experimentation.
J. R. statist. Soc. : Ser. B. : 1956 : **18** : 32–55.

This paper is concerned with the amount of experimentation that is desirable before recommending that a new process be adopted. It is supposed that a preliminary experiment of size n_1 has been performed and that it is a question of determining the size, n_2, of a second experiment in terms of n_1, the cost of the second experiment, the advantage of any increase in output from the new process, the accuracy of experimentation and the results of the first experiment. A method of calculating n_2 is described and its properties investigated and compared with other methods. A simple nomogram is given for use in practice.

996 NJOS, A. & NISSEN, O.
Standard errors of field experiments at the farm crop institute, agricultural college of Norway.
Agron. J. 1956 : **48** : 416–18.

In calculations of the standard errors for 349 experiments carried out at the Farm Crop Institute of the Agricultural College of Norway, over the period 1951–54, the average values for the coefficient of variation (CV) varied from

7·1% in barley trials to 14·5% in timothy trials, second cut, the range for 93% of the CV's being 3–17%. The CV's were larger in outlying experiments than on the experimental farm. Variation in number of treatments, plot size and yield level accounted for 10–35% of the total variation in the CV's. For all crops there was a decrease in CV's with greater yields. For potatoes the standard deviation provided a more stable measure of the error than the CV and for small grain crops in outlying experiments the ratio error mean square : average yield was the most stable measure.

997 CONAGIN, A.
Transformações dos dados experimentais. (**Transformations of experimental data**).
Bragantia 1955 : **14** : 141–47.

The use of the logarithmic transformation to eliminate heterogeneity in the within-treatment variances is illustrated by a 2 x 4 factorial experiment with maize.

998 HODNETT, G. E.
The analysis of a 3 x 6 experiment arranged in a quasi-Latin square.
Biometrics 1956 : **12** : 245–58.

Computational details are given for an experiment on star grass with three frequencies of cutting and six levels of nitrogen. Particular attention is paid to the computation of the standard errors of comparisons between treatment means adjusted for confounding. The method extends to split-plot designs.

999 CONAGIN, A.
Análise da covariância em um látice retangular simples. (**Analysis of covariance in a simple rectangular lattice**).
Bragantia 1954 : **14** : 35–50.

The technique of covariance analysis of a rectangular lattice is described and illustrated by an example drawn from a varietal trial of cotton.

1000 ARRUDA, H. VAZ DE
Delineamento em blocos incompletos balanceados com o número de variedades igual ao número de blocos. (**The balanced incomplete block design with the number of varieties equal to the number of blocks**).
Bragantia 1955 : **14** : 129–36.

The analysis of the above layout, using 21 varieties and 5 replications, is described. The example considered is a cotton varietal trial.

1001 PEARCE, S. C.
Some problems of experimental design and technique with perennial crops.
Biometrics 1956 : **12** : 330–37.

Statistical problems in dealing with material of high longevity are discussed under three headings: scientific approach, trial design and interpretation, variability and measurement.

GENETICS

1002 RYŽKOV, V. L.
(**The basic concepts of genetics**).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 193–205. [Russian].

This survey of research, mainly of work by western geneticists, gives a definition of inheritance different from that of Lysenko. Ryžkov defines it as "transmission of properties to progeny by the parents by means of nuclear and cytoplasmic structures". Continuity of heritable structures is accepted, as are also Mendelian segregation ratios. The causes of mutations and anomalous reduction divisions are among the topics discussed. Chromosomal aberrations are regarded as the real cause for changes said to occur in spring wheats trained for the winter habit in Lysenkoist experiments.

1003 WADDINGTON, C. H.
International genetics symposia in Japan.
Nature, Lond. 1956 : **178** : 1329–30.

HOROWITZ, N. H.
International genetics.
Science 1956 : **124** : 989–90.

Each of these articles gives an account of two symposia held concurrently in Japan during 6–12 September 1956: one on Applied genetics sponsored by the Science Council of Japan, and one on Physical and chemical approaches to problems in chromosomes, sponsored by the International Union of Biological Sciences.

1004 GRAYBILL, F. A., MARTIN, F. & GODFREY, G.
Confidence intervals for variance ratios specifying genetic heritability.
Biometrics 1956 : **12** : 99–109.

A breeding programme in which r males are each mated to s females and t offspring result from each mating may be analysed by a two-fold analysis of variance table into between males, between females and between full siblings. The corresponding expected mean squares are $\sigma_c^2 + t\sigma_b^2 + st\sigma_a^2$, $\sigma_c^2 + t\sigma_b^2$, and σ_c^2, where σ_a^2, σ_b^2

and σ_c^2 are respectively the variance components between males, females and individuals. The present paper gives an approximate method of setting confidence limits to the heritability ratio $h^2 = 2\ (\sigma_a^2 + \sigma_b^2)/(\sigma_a^2 + \sigma_b^2 + \sigma_c^2)$. The adequacy of the approximation is investigated by random sampling experiments. An example on poultry breeding is included.

1005 Dubinin, N. P.
(Problems and aims of radiation genetics).
Vestn. Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1956 : No. 8 : 22–23. [Russian].

In this general survey of genetics and ionizing radiation the following topics are discussed: effects of radioactivity upon human genetics and evolutionary genetics generally; interrelation between mutation and natural selection; and artificial induction of mutations and the uses of mutants in breeding. Among the achievements in research on ionizing radiation, mention is made of some economically valuable forms of cereals developed in Sweden and the USA.

1006 Lederberg, J.
Bacterial protoplasts induced by penicillin.
Proc. nat. Acad. Sci. USA 1956 : **42** : 574–77.

Protoplasts of *Escherichia coli* were obtained by placing the cells in broth supplemented with penicillin, sucrose and $MgSO_4$. It is noted that protoplast suspensions of appropriate compatibility types retained their ability to mate and that preliminary experiments have not revealed any hitherto unrecognized modes of genetic recombination.

1007 Zinder, N. D. & Ardnt, W. F.
Production of protoplasts of *Escherichia coli* by lysozyme treatment.
Proc. nat. Acad. Sci. USA 1956 : **42** : 586–90.

Protoplasts induced by lysozyme at pH 9 were capable of all the biosyntheses necessary for phage growth. Investigation of the genetic potentialities of protoplasts is under way.

1008 Garnjobst, L. & Wilson, J. F.
Heterocaryosis and protoplasmic incompatibility in *Neurospora crassa*.
Proc. nat. Acad. Sci. USA 1956 : **42** : 613–18.

Previous investigations indicated that the genes *C* and *D* and their alleles *c* and *d* affect heterocaryon formation (cf. *PBA*, XXIV, Abst. 876 and XXV, Abst. 2787). Pairs of isolates with the same genotype for these factors form heterocaryons, whereas pairs with different genotypes are incompatible as the result of an irreversible protoplasmic reaction initiated upon hyphal fusion.

1009 Leupold, U.
Tetrad analysis of segregation in autotetraploids.
J. Genet. 1956 : **54** : 427–39.

General expressions for tetrad segregation in autotetraploids are derived, assuming that (1) partner exchange between prophase chromosomes is random, (2) chiasma interference is absent and (3) chromosome disjunction at anaphase I is random. These results are compared with the analogous formulae obtained by Roman *et al.* (cf. *PBA*, XXVI, Abst. 965) on the assumption that partner exchange between prophase chromosomes is zero. The extent to which inferences on partner exchange and distance of genes from the centromere can be made from tetrad analysis of tetraploid material is discussed.

1010 Horowitz, N. H. & Fling, M.
Studies of tyrosinase production by a heterocaryon of *Neurospora*.
Proc. nat. Acad. Sci. USA 1956 : **42** : 498–501.

A heterocaryon of *N. crassa* between two strains carrying respectively the gene T^S for the thermostable form of tyrosinase and its allele T^L for the thermolabile form produced both forms of the enzyme; the alleles thus appear to act independently. The heterocaryon was resolved by means of hyphal-tip transfers; no evidence of cytoplasmic transmission of tyrosinase-forming ability was found.

1011 Jinks, J. L.
The F_2 and backcross generations from a set of diallel crosses.
Heredity 1956 : **10** : 1–30.

The theory and analysis of F_1 and parental data described in *PBA*, XXV, Absts. 2624–5 are extended in the present work to cover F_2 and back-cross generations of the diallel crosses of the same eight inbred lines of *Nicotiana rustica* as were used previously. Methods of detecting nonallelic interaction included the regression of array covariance on array variance, joint scaling tests and tests of the homogeneity of the least squares estimates of the components of variation. By inclusion of the within-family variances of the segregating generations in the analyses, linkage could be detected and its effect estimated.

All tests showed that heterosis for height was

the result of a complementary type of nonallelic interaction. The variability of the components of variation was similar both within and between seasons and is regarded as the result of an interaction between genotype and environment dependent upon soil differences. Analysis of parents and F_1 progenies alone in any one season provided a satisfactory estimate of the genetical control of height.
Significant interseasonal differences in the assessment of the genetical control of flowering time could be related to differences in weather and involved both variation in the magnitude of the components of variation and differences due to the occurrence of duplicate gene interactions during one season (1953) but not the other (1952). Linkage between alleles which exhibit reinforcing dominance relations was detectable in the flowering-time data for 1952 and involved at least four factors.

1012 Esser, K.
Die Incompatibilitätsbeziehungen zwischen geographischen Rassen von *Podospora anserina* (Ces.) Rehm. 1. Die genetische Analyse der Semi-Incompatibilität. [**Incompatibility relationships between geographical races of *P. anserina* (Ces.) Rehm. 1. Genetical analysis of semi-incompatibility**].
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 595–624.

Analysis of the genetical behaviour of strains M and s (cf. *PBA*, XXV, Abst. 2790–92) and their respective offspring led to the deduction of the genetical formulae $t_1u_1v_1a_1b_1c_1$ for M and $t\ u\ v\ a\ b\ c$ for s. Of these factors, only t and b are linked. The formation of incompatibility barriers between strains M and s is brought about by the combinations $a\ b$ x a_1b_1 and $c\ v$ x c_1v_1, either one of which is sufficient to cause incompatibility. Other strains from a number of geographical regions in France also proved incompatible when crossed with each other. Incompatibility is not, however, found among genetically identical organisms and the mechanism here described thus appears to promote inbreeding and discourage outbreeding in *P. anserina*.

1013 Esser, K. & Straub, J.
Fertilität im Heterocaryon aus zwei sterilen Mutanten von *Sordaria macrospora* Auersw. (**Fertility in the heterocaryon from two sterile mutants of *S. macrospora* Auersw**).
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 625–26.

Self-sterile mutants producing protoperithecia, but not fruiting bodies, were obtained by subjecting ascospores of the self-fertile ascomycete *S. macrospora* to X irradiation. A study of the progenies of crosses between the mutants and the initial wild strain showed that two mutant genes, designated S_1 and i_1, were responsible for self sterility. Certain of the self-sterile mutants could be crossed with each other, suggesting that the formation of fruiting bodies in such crosses may be due to the action of certain compensatory genes in the heterocaryon.

1014 Arkel, G. A. v.
Enige aspecten van het genetisch onderzoek met schimmels. (**Some apsects of genetical research with fungi**).
Genen en Phaenen 1956 : **1** : No. 4 : 5–8; No. 5 : 9–15.

The literature on the use of fungi in genetical research is reviewed, with special reference to hybridization, the induction of mutations and the biochemical aspect of genetical changes.

1015 Pateman, J. A. & Fincham, J. R. S.
Multiple alleles at a locus concerned with glutamic dehydrogenase production in *Neurospora crassa.*
Heredity 1956 : **10** : 279–80. (Abst.).

By means of ultraviolet irradiation, back mutants to the wild type were obtained from *am* strains deficient in glutamic dehydrogenase activity. The *am* strains showed different rates of back mutation. In all the 54 back mutants analysed, the mutant locus was within 1 cM of the *am* locus and all were able to produce the enzyme, although seven possessed only very low enzyme activity. Crosses of one of the latter with the wild type and the *am* type gave 2 : 2 segregations for high : low and low : no enzyme activity respectively. The low enzyme activity is thought to be determined by an intermediate allele am^1 although it may result from the action of a closely linked suppressor.

1016 Baylor, M. B. & Hurst, D. D.
Genetic suppression of host range in the T_2 coliphage.
Genetics 1956 : **41** : p. 634. (Abst.).

Host range in T2 is not only under the control of a series of *ht* loci acting as a polygenic system responsible for increased host range, but is also determined by a series of *su* loci, each of which reduces host range. The three *su* mutants so far tested genetically involve loci distinct from one another and from mapped *ht* loci. These mutations caused reduction in host range regardless of which *ht* markers were present. Two possible interpretations of the results are put forward: the *su* genes may suppress the formation of a substance necessary for the expression of host range, or the *ht* and *su* series may represent alleles of the same loci, the final phenotype being the result of the relative numbers of loci in the *ht* and *su* conditions.

1017 Bennett, J. H.
Lethal genes in inbred lines.
Heredity 1956 : **10** : 263–70.

Isolated lethal genes are eliminated by inbreeding, but completely linked recessive lethal genes in the trans position form a balanced system which enforces heterozygosity at these and other loci and is perpetuated by inbreeding. By means of matrix methods it is calculated that with natural mutation rates the frequency of occurrence of balanced systems in inbreeding is negligible. Where higher mutation rates caused by mutagens occur, or in regions of the germ plasm where crossing over cannot take place, the frequency of balanced lethal systems might not be negligible. A basis is provided for determining what intensity of mutation would be too great for the lethal mutations occurring in inbred lines to be eliminated.

1018 Horner, T. W., Comstock, R. E. & Robinson, H. F.
Non-allelic gene interactions and the interpretation of quantitative genetic data.
Tech. Bull. NC agric. Exp. Sta. 1955 : No. 118 : Pp. 117.

Expectations of genotypic means, variances and covariances, assuming the operation of epistasis in symmetrical form and neither selection nor linkage, are derived. Four interaction models, complementary, duplicate factor, multiplicative and optimum number, are considered. The formulae obtained are used to evaluate the bias due to epistasis in estimates of average dominance, additive genetic variance and dominance variance derived from the maize experiment described earlier by Comstock and Robinson (cf. *PBA*, XXIII, p. 673). Bias was found to be serious in a number of cases.

1019 Sinsheimer, R. L.
The glucose content of the deoxyribonucleic acids of certain bacteriophages.
Proc. nat. Acad. Sci. USA 1956 : **42** : 502–04.

The nucleic acids of T2 and T4 and of progenies of various crosses between these phages differ with respect to the amount of hydroxymethylcytosine (HMC) substituted by glucose. In the wild-type T2 ($r^+h^+u^+$) 23% of the HMC is not substituted by glucose whereas in T4 (r^+u) all the HMC is glucose-substituted. The inheritance of glucose substitution is not linked with *r*, *h* or *u*.

1020 Streisinger, G. & Weigle, J.
Properties of bacteriophages T2 and T4 with unusual inheritance.
Proc. nat. Acad. Sci. USA 1956 : **42** : 504–10.

Markers of T2 are partly excluded in crosses of T2 x T4. Two other properties are associated with this excluding power of T4: (1) a high efficiency of plating on certain strains of bacteria as compared with the low efficiency of T2 and (2) the complete glucosylation of hydroxymethylcytosine of T4 (cf. Abst. 1019). These three properties, unlike markers involving the *r*, *h* and *u* loci, are transmitted to most of the progeny of T2 x T4, and are referred to collectively as the "bar" properties; T2 particles having these properties are denoted as $\overline{\text{T2}}$. The progeny of a cross of T2 x T4, subsequently made highly isogenic with T2 by repeated back crossing, retained all three of the bar properties. When infection by $\overline{\text{T2}}$ is delayed until several minutes after infection with T2, mixed bursts were obtained, containing bar and nonbar phage, as indicated by efficiency of plating; some of the particles appeared to show a lack of association of bar properties. A genetic model is suggested to explain the phenomena of partial exclusion of markers and separability of bar properties; an explanation of the excluding power of T4 in terms of glycosylation of DNA is also attempted.

1021 Skaar, P. D. & Garen, A.
The orientation and extent of gene transfer in *Escherichia coli*.
Proc. nat. Acad. Sci. USA 1956 : **42** : 619–24.

"Nonsimultaneous gene transfer from *Hfr* [F+ or high frequency of recombination] to F− conjugating cells in *E. coli* K12 is confirmed. This transfer is oriented; certain genes regularly are transferred earlier than others. The sequence of transfer depends upon the *Hfr* strain employed, possibly due to structural differences. Sequential transfer is demonstrable among spontaneous exconjugants, strengthening the view that, normally, incomplete genomes are transferred." [Authors' summary].

1022 Sermonti, G. & Spada-Sermonti, I.
Gene recombination in *Streptomyces coelicolor*.
J. gen. Microbiol. 1956 : **15** : 609–16.

Several biochemical mutants, obtained by ultraviolet irradiation at the Istituto Superiore di

Sanità [Main Institute of Hygiene], Rome, were plated together in pairs and in several cases syntrophic tufts were produced on some media in the zone of contact between two colonies. It was not found possible to obtain segregates from these prototrophic recombinants, which have remained stable for two or three subcultures. However three types of auxotrophic clones were isolated from mixed cultures; (1) with all the wild characters of the original strain, (2) with some of the wild characters of one strain and one of the mutant characters of the other strain and (3) with mutant characters from both strains. It is concluded that the appearance of the new, stable prototrophic clones is the result of parasexual recombination between two auxotrophic clones.

1023 Buchwald, N. F.

On the dimorphism of the ascospores and their arrangement in the ascus of *Monilinia oxycocci* (Wor.) Honey (Syn. *Sclerotinia oxycocci* Wor.).

Friesia 1956 : **5** : 196–203.

Asci of the above species contain four large and four small spores. In 100 asci taken at random from a single apothecium the character appeared to be determined by a single gene pair. The three types of ascospore arrangement distinguished were interpreted as arising from (*a*) segregation in the first meiotic division, (*b*) segregation in the second meiotic division and (*c*) segregation in either the first or the second division followed by nuclear translocation. It is suggested that this species would be suitable for cytological and genetical work.

1024 Ishitani, C.

A high frequency of heterozygous diploids and somatic recombination produced by ultra-violet light in imperfect fungi.

Nature, Lond. 1956 : **178** : p. 706.

The author obtained heterozygous diploids of the asexual fungi *Aspergillus sojae* and *A. oryzae* by the application of methods similar to those used by Pontecorvo and his colleagues (cf. *PBA*, XXIII, Abst. 1725 and XXV, Abst. 90). In addition, he found that treatment of conidia of heterocaryons with ultraviolet rays increased the frequency of heterozygous diploids and that ultraviolet irradiation stimulated somatic segregation in these diploids. Camphor treatment also increased the frequency of diploidization but its effect was much less marked than that of ultraviolet irradiation.

1025 Shult, E. E. & Lindegren, C. C.

The determination of the arrangement of genes from tetrad data.

Cytologia, Tokyo 1955 : **20** : 291–95.

From a theoretical consideration of the segregation types obtainable from crosses involving three linked genes the following definition of order is developed: three genes are said to be ordered if the segregation of the distal genes is the result of the simultaneous segregation of the intermediate genes. Equations are given for the determination of order and may be applied to any three genes lying either on one chromosome or, since tetrad analysis allows centromere linkage to be detected, on two different chromosomes linked through their centromeres (cf. *PBA*, XXVI, Abst. 958). The method requires the absence of chromosomal interference.

1026 Shult, E. E. & Lindegren, C. C.

A general theory of crossing-over.

J. Genet. 1956 : **54** : 343–57.

Previous theories of crossing over have assumed that short chromosome map distances imply a low recombination frequency. The authors develop a general theory of crossing over without making this assumption by using a linear algebra on the three tetrad types, *I*, *II* and *III*, encountered in tetrad analysis. Scalar multiplication, $a_i I$, is used to signify that the probability that a cross-over complex is of type *I* is a_i. Multiplication, $II.III = III$, indicates that the combined effect of adjacent cross-over complexes *II* and *III* is *III*. By this method it is shown that exact linkage distance can be calculated provided that (1) chromatid interference can be measured, (2) cross-over occurrence is independent with respect to the linear position of other cross overs and (3) the proportion of sisterstrand to homologous exchanges is known.

1027 Stadler, D. R.

A map of linkage group VI of *Neurospora crassa*.

Genetics 1956 : **41** : 528–43.

The position of eight markers in linkage group VI was determined with respect to the marker *asco* and the centromere. Their order, as established by means of three and four-point crosses, was: *cyt* – *asco* – *un* – *cys*-2 – *cys*-1 – *ylo* – *ad*-1 – centromere – *rib*-1 – *tryp*-2. Since a given chromosome region showed markedly different rates of crossing over in different crosses and since the factors governing this are not known, the estimation of absolute distances between markers is considered to be of little value.

Studies of second-division segregation frequencies for *asco* in crosses incubated at 25° C. and at 18° C. revealed that crossing over between *asco* and the centromere was two or three times as great at the lower as at the higher temperature. This effect was utilized in establishing that *ad*-1, which is closely linked to the centromere, lies on the left arm.

1028 Matsuura, H.

(Criticisms of the chiasmatype theory).

Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1948 : **61** : 55–57. [Japanese].

Various criticisms of the commonly held theory on the nature of crossing over are put forward (cf. *PBA*, XXI, Absts. 81 and 2308).

1029 Revell, S. H.

Evidence for an exchange hypothesis for "chromatid" aberrations induced by X-rays.

Heredity 1956 : **10** : p. 123. (Abst.).

Quantitative data supporting the hypothesis of chromatid exchange presented earlier (cf. *PBA*, XXVI, p. 510) have been obtained from X-ray experiments with *Vicia*.

1030 Rutishauser, A.

Chromosome distribution and spontaneous chromosome breakage in *Trillium grandiflorum*.

Heredity 1956 : **10** : 367–407.

Studies of the staining reactions and variability of heterochromatic segments, cytological investigations of crossing over in the endosperm and spontaneous chromosome breakage in *T. grandiflorum* are described and discussed.

1031 Howe, H. B. (Jun.).

Crossing over and nuclear passing in *Neurospora crassa*.

Genetics 1956 : **41** : 610–22.

Studies of crossing over in regions on both sides of the centromere in the sex chromosome, carried out by means of tetrad analysis, showed that the ratio of 2, 3 and 4-strand double crossovers did not differ significantly from the chance expectation of 1 : 2 : 1, indicating that no chromatid interference or interference across the centromere occurs.

Use of an independent centromere marker allowed misarrangements arising from meiotic nuclear passing or from errors in dissection to be detected; such misarrangements were found in 0·2–0·5% of the asci analysed.

1032 Stadler, D. R.

Double crossing over in *Neurospora*.

Genetics 1956 : **41** : 623–30.

Analyses of crossing over were carried out in 8455 asci from *N. crassa* crosses involving the gene *asco* and one or more marker genes on the other side of the centromere on the same chromosome. The results of tests for chromosome and chromatid interference indicated that crossing-over events in one arm of a chromosome are independent of those in the other arm.

1033 Calef, E.

Functional relationships between three adenineless mutants in *Aspergillus nidulans*.

Heredity 1956 : **10** : p. 279. (Abst.).

Three adenineless mutants, representing three different sites of mutation, show the following relationships: two, ad15 and ad17, are partially complementary, the diploid repulsion heterozygote being intermediate in growth between the haploid mutant and the wild type in the absence of adenine; the third, ad13, is allelic to both the others, the diploids ad13/ad15 and ad13/ad17 being unable to grow without adenine. Since ad13 gives prototrophs in crosses with either of the other two it seems unlikely to be a deficiency or a mutation involving both sites.

1034 Griffing, B.

Concept of general and specific combining ability in relation to diallel crossing systems.

Aust. J. biol. Sci. 1956 : **9** : 463–93.

A detailed mathematical treatment of the problem of estimating general and specific combining ability from diallel crosses involving various combinations of parental inbreds, F_1 hybrids and F_1 reciprocals is provided. A numerical example, based on the maize data published by Griffing and Lindstrom (cf. *PBA*, XXV, Abst. 1030), is provided.

1035 Fryxell, P. A.

On the measurement of natural crossing.

Agron. J. 1956 : **48** : 426–27.

The formula $k_1 = \dfrac{2h - h'}{1 - h'}$ is presented, in which k_1 is the proportion of outcrossing, h' the proportion of heterozygotes in a population and h the proportion of heterozygotes in the succeeding population. It is shown that the formula of Mahbub Ali and Hadley (cf. *PBA*, XXVI, Abst. 1954) is a generalized form of this for the nth generation and becomes, when $n = 1$, $k_2 = \dfrac{2h - h'}{4pq - h'}$ where p and q are the frequencies of the two alleles of the gene under investigation and where $p = 1 - q$. Thus, unless $p = q = 0{\cdot}5$, k_1 will not equal k_2 but will be biased. It is shown that the magnitude of the bias is given by $x = k_2 \left[\frac{1 - 4pq}{1 - h'}\right]$.

1036 Kamerbeek, G. A.
Peroxydase content of dwarf types and giant types of plants.
Acta bot. neerl. 1956 : **5** : 257–63.

Analysis of *Tropaeolum majus*, derivatives of *Phaseolus vulgaris* x *Ph. multiflorus*, hybrids of *Nicotiana tabacum* and seedlings obtained from an ear of dwarf maize indicated that, compared with normal plants, dwarf types had a higher content of peroxidase in the leaves and giant types a lower content. Since in some cases tall growth may be heterotic, analysis of peroxidase content may prove valuable in elucidating the physiological basis of heterosis.

1037 Hayman, B. I. & Mather, K.
Inbreeding when homozygotes are at a disadvantage: a reply.
Heredity 1956 : **10** : 271–74.

In reply to criticisms by Haldane (cf. *PBA*, XXVI, Abst. 1960), the authors reaffirm their belief in the applicability of matrix algebra to the treatment of inbreeding. Generalizing their earlier treatment (cf. *PBA*, XXIV, Abst. 26), the authors show that the results obtained by matrix methods are largely identical with those obtained by Haldane from difference equations.

1038 Reeve, E. C. R.
The effects of selection and linkage on inbreeding progress.
Heredity 1956 : **10** : p. 125. (Abst.).

It is reported that a simple general solution has been developed for the effects of selfing when the homozygous phases of the two alleles at a locus are under different selection pressures and the intensities of selection within and between lines are also different: this makes possible a comparison of the relative importance of selection within and between lines in retarding inbreeding progress. A general formula has also been obtained for the magnitude of the linkage effect during inbreeding by selfing when selection against homozygosis at one locus slows down inbreeding progress at other loci which are linked to it but not directly affected by selection.

1039 Horowitz, N. H.
The gene.
Sci. Amer. 1956 : **195** : No. 4 : 79–90.

After a short account of the work of Mendel and others on segregation, linkage and chromosomes, the following topics are briefly discussed: self duplication of genes, gene mutation, the theory that genes act as templates for individual enzymes, the chemical composition of genes, the function of DNA and RNA and the Watson-Crick model of the structure of DNA.

1040 Lindegren, C. C. & Lindegren, G.
Effect of the local chromosomal environment upon the genotype.
Nature, Lond. 1956 : **178** : 796–97.

An analysis was made of 34 tetrads from a single family of yeast obtained from a cross between one parent with the genotype *α SU me MA mg cd hi an PR* and another with the genotype *a su ME ma MG CD HI AN pr* for mating type, fermentation of sucrose, melibiose, maltose and methyl α-glucopyranoside, cadmium resistance and synthesis of histidine, anthranilic acid and proline, respectively. In 22 of the tetrads each of the nine gene pairs segregated regularly. In five, one gene pair segregated irregularly. Among the remainder of the tetrads, three, three and one underwent irregular segregation with respect to two, three and five gene pairs respectively. The departures from the regular 2 : 2 ratio are ascribed to gene conversion from the dominant to the recessive condition or *vice versa*. In the case of *CD*/*cd*, conversion involved a change to a recessive gene which differed from the original one, *CD* or *cd* undergoing conversion to cd^M which determined a capacity to achieve cadmium resistance slowly, a property not associated with *cd*. In the tetrad with five irregularities, *an* and *pr* were converted to the dominant state but *MG*, *CD* and *HI* underwent a change to the recessive condition. Both parents required adenine for growth; the fact that neither was pink indicated a further lack in synthetic capacity since the ability to synthesize methionine is essential for the production of pink pigment in adenine-dependent cultures. Eight asci each produced one pink culture; another three each gave rise to two such cultures. The remainder produced no pink cultures. None of the pink derivatives was able to grow in the absence of adenine but 13 tetrads contained single segregates which grew in the absence of adenine after a longer delay than usual for a clone carrying the standard dominant gene. One tetrad included two such "slow" segregates. It is suggested that local differences in the amount of substances required for the synthesis of nucleic acid may be expected in cells unable to synthesize adenine and that gene conversion to the dominant or recessive condition depends upon highly localized nutritional irregularities in the cell.

1041 Lederberg, J. & Iino, T.
Phase variation in *Salmonella*.
Genetics 1956 : **41** : 743–57.

Transduction experiments have shown that phase variation in the flagellar antigens of *Salmonella* spp. depends upon an alternation of states of the locus H_2, together with the complementary action of H_1 which does not vary in its heritable condition. When H_2 is in the active condition, H_1 is functionally suppressed, but when H_2 is in the inactive state, H_1 is expressed.

1042 Glover, S. W.
The genetic control of methionine synthesis in *Salmonella*.
Heredity 1956 : **10** : p. 280. (Abst.).

On the basis of transduction tests, 32 independently isolated methionineless mutants of *S. typhimurium* could be divided into five groups, the number of transductions taking place between members of the same group being smaller than that between members of different groups or between mutants and the wild type. There was complete correspondence between the above grouping and grouping according to biochemical tests. It is suggested that each group represents a single locus; that the different members in each group correspond to non-identical alleles; and that within each group, the small number of transductions represents the infrequent recombination occurring between pseudoalleles.

The high frequency with which bacteria carrying two auxotrophic markers can be transduced to prototrophy by means of phage raised in wild-type bacteria indicates that the methionine loci are linked to several loci controlling the synthesis of cysteine and tryptophane.

1043 Bailey, W. R.
Studies on the transduction phenomenon. II. The occurrence of *Salmonella* transducing phages in nature.
Canad. J. Microbiol. 1956 : **2** : 555–58.

Transduction of motility to nonmotile strains of *Salmonella* by phage offers a means of serological analysis.

An investigation of 115 strains of *S. typhimurium* revealed that 12·1% carried transducing phage. The possible role of transduction in serotypical variation is discussed.

1044 Hotchkiss, R. D. & Weiss, E.
Transformed bacteria.
Sci. Amer. 1956 : **195** : No. 5 : 48–53.

This popular account of transformation in bacteria, with special reference to pneumococci, outlines some of the factors influencing the rate and effectiveness of transformation and describes briefly the action of DNA from other organisms upon pneumococci.

1045 Klein, D. T. & Klein, R. M.
Quantitative aspects of transformation of virulence in *Agrobacterium tumefaciens*.
J. Bact. 1956 : **72** : 308–13.

DNA from the filtrates of cultures of five donor strains differing in virulence was tested for transforming activity against five recipient strains. Only certain donor-recipient combinations were effective. Transformed strains became increasingly virulent with three successive subcultures in the absence of the transforming principle and could subsequently be transformed to greater virulence by further exposure to transforming principle. Over 30% of the single-cell isolates from transformed populations were significantly more virulent than isolates from the unaltered recipient population. The host range of a transformed strain was narrower than that of the donor. It is suggested that virulence is controlled by multiple alleles at multiple loci.

1046 Morse, M. L., Lederberg, E. M. & Lederberg, J.
Transductional heterogenotes in *Escherichia coli*.
Genetics 1956 : **41** : 758–79.

Further investigations on the transduction of Gal^+ genes to galactose-negative cells (Gal^-) by means of λ phage are reported (cf. *PBA*, XXVI, Abst. 3040). The Gal^+ alleles in the heterogenotes were dominant over the Gal^- factors, except in the *trans* arrangement with respect to loci Gal_1 and Gal_4, between which a position effect was expressed. Heterogenotes undergo three modes of division: (1) mitosis, resulting in propagation of the original heterogenote, (2) reduction to haploids containing markers of the original recipient cell, the transduced fragment, or a recombination of markers from these two sources as the result of crossing over, and (3) automixis.

1047 Okabe, N. & Gotō, M.
(Studies on *Pseud. solanacearum*. X. On genetic changes induced in strains of the bacterium by the temperate virus T-$_c$200).
Shizuoka Daigaku Nogakubu Kenkyu Hokoku/Rep. Fac. Agric. Shizuoka Univ. 1955 : No. 5 : 57–62. [Japanese].

Changes in lysogenic properties, fermentative power and virulence towards tobacco and sesame have been effected in strains of the above bacterium by transduction with phage $T_{-c}200$ (cf. *PBA*, XXVI, Abst. 1573).

1048 Iseki, S.
(Immunogenetic studies on micro-organisms).
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 262–68. [Japanese].

Instances of antigenic transformation and transduction involving *Salmonella* strains are described and discussed.

1049 Stocker, B. A. D.
Abortive transduction of motility in *Salmonella*: a non-replicated gene transmitted through many generations to a single descendant.
J. gen. Microbiol. 1956 : **15** : 575–98.

Experimental evidence is presented in support of the hypothesis that (1) a phage-imported nonreplicated gene confers on the organism receiving it the ability to synthesize motility-conferring (MC) particles, which are distributed amongst its non-gene-bearing progeny, which cannot make new ones, (2) each particle may be unilinearly transmitted for many generations and (3) while one MC particle confers motility in broth several are needed to enable a bacterium to travel in a semisolid medium.

1050 Michaelis, P.
Über Gesetzmässigkeiten der Plasmon-Umkombination und über eine Methode zur Trennung einer Plastiden-, Chondriosomen-, resp. Sphaerosomen-, (Mikrosomen)- und einer Zytoplasmavererbung. [**On the rules governing plasmon recombination and a method of distinguishing plastid, chondriosomal and spherosomal (microsomal) inheritance from cytoplasmic inheritance**].
Cytologia, Tokyo 1955 : **20** : 315–38.

A plasmon is defined as the sum of all extranuclear hereditary factors in a cell or individual. A method of calculating the degree of mixing and redistribution of cytoplasmically transmitted hereditary factors expected to occur within a single individual is presented, the assumptions being made that their number per cell remains constant and that they are randomly distributed to daughter cells at cell division. New combinations of such factors within a single cell may arise through sexual, especially isogamous, fertilization or through mutation, and the rapidity with which a cell containing only the new or mutated factor subsequently appears depends on the number of competing factors present in each dividing cell, on the relative proportions of the normal and mutated factors in the original cell and on the rate of cell division. The application of these considerations to genetical, cytological and developmental studies of *Epilobium* carrying the maternally inherited *albomaculata* type of variegation indicated that the condition was transmitted not by plastids but by some other cytoplasmic inclusion present in greater numbers in the cell; transmission through the spherosomes is postulated.

1051 Badenhuizen, N. P.
Some aspects of cytoplasmic inheritance.
S. Afr. J. Sci. 1956 : **53** : 82–88.

Some of the more recent literature on cytoplasmic inheritance in plants and animals is reviewed. The author suggests that a more extensive physicochemical investigation of cytoplasmic particles should now replace speculation concerning their possible genetic function.

1052 Sirks, M. J.
Plasma èn genen, geen plasmagenen. (**Cytoplasm and genes, not plasmagenes**).
Genen en Phaenen 1956 : **1** : No. 4 : 1–4.

In this discussion on the nature of the gene and the significance of cytoplasmic inheritance, the author warns against too free a usage of the term plasmagene. The hereditary elements so far identified in the cytoplasm would appear to bear some correspondence to the chromosomes but so far no direct evidence for the existence of cytoplasmic genes has been obtained.

1053 Gowdridge, B. M.
Heterocaryons between strains of *Neurospora crassa* with different cytoplasms.
Genetics 1956 : **41** : 780–89.

The cytoplasm of poky and mi 3 strains did not interact in heterocaryons to produce a wild type or a strain growing faster than either component (cf. *PBA*, XXIV, Abst. 1672). Heterocaryons involving the cytoplasms of (*a*) poky and the wild type, (*b*) poky and mi 3, and (*c*) mi 3 and the wild type respectively showed the cytoplasmic properties of (1) the wild type, (2) mi 3 in most cases but poky occasionally and (3) mi 3 or the wild type. No intermediate state of the cytoplasm was detected, nor were poky and mi 3 found to be "dominant" over the wild type in the way which might be expected if either condition were caused by an infective agent.

1054 Frankel, R.

Graft-induced transmission to progeny of cytoplasmic male sterility in *Petunia*.

Science 1956 : **124** : 684–85.

The F_1 progeny of fertile scions grafted on to cytoplasmically male-sterile stocks consistently comprised both male-sterile and male-fertile plants, whether resulting from selfing or sibbing. Back crosses of the sterile and fertile plants with the scion variety as ♂ gave only male-sterile and fertile plants respectively. The induced change was probably due to movement of cytoplasmic determinants of ♂ sterility from stock to scion. The following possibility should however also be considered: nutritional deficiency induced by grafting may have caused a disturbance in cytoplasmic enzyme activity so as to lead to an increase or decrease of the determinants.

1055 Sharpe, H. S.

Extra-nuclear inheritance in a homothallic fungus.

Heredity 1956 : **10** : p. 280. (Abst.).

A strain of *Aspergillus glaucus* gives rise to a distinct type of sector at a rate of approximately 5 x 10^{11}/micron^3 of mycelium but otherwise propagates true under all conditions. The sector type propagates true when inocula consisting of blocks of mycelium or masses of sexual or asexual spores are used, but when the dilution plate technique is used, the single spores give segregating cultures of the parental and sector types. By means of a cross-grafting technique it has been shown that the determinants controlling the sector type reassociate vegetatively with the nuclei formerly present in the original type. To explain the observations, a genetic model based on extranuclear self-replicating particles is proposed.

1056 Pittenger, T. H.

Synergism of two cytoplasmically inherited mutants in *Neurospora crassa*.

Proc. nat. Acad. Sci. USA 1956 : **42** : 747–52.

Pittenger, T. H.

Complementary cytoplasmically inherited mutants in *Neurospora*.

Genetics 1956 : **41** : p. 656. (Abst.).

The heterocytosome of the cytoplasmically inherited mutants "poky" and mi-4, both of which are characterized by a subnormal growth rate and defective cytochrome system, grew normally. The synergistic interaction of the two mutants cannot at present be satisfactorily explained.

1057 Quadling, C. & Stocker, B. A. D.

Differentiation of cells within clones of *Salmonella*: spontaneous phenotypic variation in respect of motility.

Heredity 1956 : **10** : p. 123. (Abst.).

The progenies of motile cells found in very low frequencies in strains formerly regarded as nonmotile were all or nearly all nonmotile after several generations and indistinguishable from the parent strain. The motile cells occurred in randomly distributed small groups which appeared to arise from division of single differentiated cells. It is thought that each cell in strains behaving in this manner has a genetically determined low probability of undergoing differentiation.

Population genetics: the nature and causes of genetic variability in populations.

Cold Spring Harbor symposia on quantitative biology 1955 : **20** : Pp. 346.

The following papers are relevant to plant breeding:—

1058 *Dobzhansky, T. A review of some fundamental concepts and problems of population genetics. (pp. 1–15).*

The following topics are reviewed: the different types of Mendelian population, non-Mendelian or partially Mendelian populations, the adaptive norm, heterozygosis and homeostasis and the role of selection.

1059 *Wright, S. Classification of the factors of evolution. (pp. 16–24).*

The best classification of evolutionary factors from the point of view of population genetics is discussed mathematically by considering their effects on gene frequency, principal attention being given to the effects of recurrent mutation, immigration and selection. Appendices follow on change of gene frequency under selection assuming random combination, rotational changes in sets of gene frequencies, time rates of changes of $\overline{W}$ and V_{I}, internal selective value and intrabrood selection.

1060 *Dempster, E. R. Maintenance of genetic heterogeneity. (pp. 25–32).*

Various ways by which genetic heterogeneity in a population is maintained are discussed, in particular mutation pressure, overdominance and selection intensity varying with time. Kimura (cf. *PBA*, XXV, Abst. 37) has shown that variable selection results in quasifixation or quasiloss of alleles after many generations. The author finds that variable selection can have the opposite effect, intermediate frequencies of neutral or slightly deleterious genes being conserved under appropriate circumstances.

1061 *Kimura, M. Stochastic processes and distribution of gene frequencies under natural selection.* (*pp. 33–53*).

Extending the analysis of his earlier papers (cf. *PBA*, XXV, Abst. 37 and XXVI, Abst. 838), the author treats evolution as a stochastic process of change in gene frequency; the mathematics is worked out in terms of spheroidal wave functions. It is shown that there is a considerable chance of a nonadaptive gene being fixed if Ns is less than 1, where N = effective population size and s is the selective advantage of the gene over its allele. When s fluctuates randomly from generation to generation but $\bar{s} = 0$, quasifixation or quasiloss would eventually occur (cf. *loc. cit*). For a favourable gene, random fluctuation causes a reduction in the probability of fixation though this reduction may be very small. For small populations, random fluctuations in selection intensity do not greatly affect the gene frequency distribution at the steady state. With large populations, random fluctuation may have a considerable effect on the frequency distribution. Cyclic changes in selection intensity are briefly considered; their analysis presents serious mathematical difficulties.

1062 *Crow, J. F. General theory of population genetics: synthesis.* (*pp. 54–59*).

The conclusions and methods of the three previous papers are reviewed and brought into relation with the work of Fisher. An extension of Fisher's treatment of natural selection to cover interpopulation selection is suggested.

1063 *Kempthorne, O. The correlations between relatives in random mating populations.* (*pp. 60–78*).

The method of treating biometrical inheritance as a factorial problem in which correlations between relatives are calculated is described. The treatment is based on the publications by the author summarized in *PBA*, XXV, Absts. 2639 and 2644 and XXVI, 46 and 830. Extensions to cases involving autotetraploidy, maternal inheritance and inbreeding are also considered.

1064 *Hayman, B. I. The description and analysis of gene action and interaction.* (*pp. 79–86*).

The method of algebraic analysis of quantitative inheritance referred to in *PBA*, Abst. XXV, Abst. 2625 is further expounded with special reference to inheritance under selfing.

1065 *Sprague, G. F. Problems in the estimation and utilization of genetic variability.* (*pp. 87–92*).

The reasons for the apparently diverse estimates of genetic variability derived from long-term selection experiments for various characteristics, in particular oil content and yield in maize, are examined. It is pointed out that it is quite uncertain as to whether equilibrium conditions prevail in open-pollinated maize. Lack of basic information on genetic variability means that plant-breeding techniques are largely empirical. The bearing of these observations on the various methods of recurrent selection is discussed.

1066 *Comstock, R. E. Theory of quantitative genetics: synthesis.* (*pp. 93–102*).

The principal topics discussed in this general review of quantitative genetical problems are the nature of genotype-environment interaction, the reliability of estimates of additive genetic variance, dominance level and the estimation of epistasis.

1067 *Manning, H. L. Response to selection for yield in cotton.* (*pp. 103–10*).

The programme of selection of PB52 Upland cotton in Uganda is described. Selection was made on the basis of an index combining information on bolls per plant, seeds per boll, and lint per seed. Genetic advance of the order of 35% was obtained for the inbred material. Considerable heterozygosity remained after 7 generations of selfing and possible reasons for this are discussed. (Cf. Abst. 1976).

1068 *Haskell, G. Analyses of sexual-apomictic blackberry populations and their ecological consequences.* (*pp. 111–26*).

In the first part of this paper, graphical methods, including polygonal graphs, correlation diagrams and pictorial scatter diagrams are compared in respect of their usefulness in discriminating between sexual and apomictic *Rubus* populations. The second part discusses the relation between heterosis and seed germination (cf. *PBA*, XXVI, Abst. 44).

1069 *Robinson, H. E. & Comstock, R. E. Analysis of genetic variability in corn with reference to probable effects of selection.* (*pp. 127–36*).

The research programme on the quantitative genetics of yield in maize in progress at the North Carolina Experiment Station is described. The methods used to estimate additive genetic variance and dominance level in inbred and open-pollinated material are explained. Genes affecting yield ranged from partially to completely dominant; it was possible to explain the results without postulating overdominance. Apparent overdominance could be accounted for by upward bias due to linkage effects. Other topics discussed include the concordance between estimates of additive genetic variance and effectiveness of selection, and genotype-environment interaction.

1070 *Sakai, K.-I. Competition in plants and its relation to selection.* (*pp.* 137–57).
A digest of recent work by the author and his colleagues and by H. Oka on the effects of intergenotypic competition in barley, rice and other species is presented. The series of original papers on which the present one is based have been summarized *passim* in *Plant Breeding Abstracts.*

1071 *Mather, K. Response to selection.* (*pp. 158–65*).
The four preceding papers are discussed with special reference to the stabilizing or disruptive effect of selection and to gene interaction, in particular gene-environment interactions.

1072 *Ford, E. B. Rapid evolution and the conditions which make it possible.* (*pp. 230–38*).
Circumstances leading to rapid evolution, in particular small population size and cyclical fluctuation in numbers, are discussed, also the evolutionary role of polymorphism.

1073 *Sheppard, P. M. Genetic variability and polymorphism: synthesis.* (*pp.* 271–75).
The action of selection on polymorphic populations and the evolutionary significance of the supergene are discussed.

1074 *Carson, H. L. The genetic characteristics of marginal populations of* Drosophila. (*pp. 276–87*).
It is shown that, near the margin of distribution, *D. robusta* is relatively homozygous for gene order, while the central populations have a high degree of chromosomal polymorphism. It follows that gene recombination is more likely to occur at the periphery than at the centre of distribution. It is suggested that cosmopolitan species such as *D. melanogaster*, with little chromosomal polymorphism, arose from an endemic marginal population.

1075 *Nicholson, A. J. Density governed reaction, the counterpart of selection in evolution.* (*pp. 288–93*).
The role of environmental reactions induced by population density in maintaining finite population size is discussed.

1076 *Buzzati-Traverso, A. A. Populations in time and space: synthesis.* (*pp. 300–02*).
The principal topics considered in this short review are population fitness and the possible evolutionary role of high mutation rate.

1077 *Mayr, E. Integration of genotypes: synthesis.* (*pp. 327–33*).
The need for revising the basic principles of population genetics so that the selective value of a gene can be dealt with relativistically is urged. Selective value of a gene now appears to depend on many circumstances, including population size. The somewhat divergent results reported on the connexion between fitness and heterozygosity may be resolvable if some such relativistic conceptual framework can be devised.

1078 *Lerner, I. M. Concluding survey.* (*pp. 334–40*).
The salient contributions to the symposium are briefly reviewed, special emphasis being laid on the importance of the various types of gene interaction that have now been detected.

1079 BENNETT, J. H.
Population genetics and natural selection.
Genetica 1956 : **28** : 297–307.
Comments on various aspects of R. A. Fisher's mathematical treatment of natural selection are presented. It is pointed out that the term genetic variance is being used equivocally: the genetic variance of American writers often corresponds to the genotypic variance of Fisher, while what Fisher defined as genetic variance is frequently designated as additive genetic variance in America. Li (cf. *PBA*, XXVI, p. 697) is criticized for equating rate of increase of fitness with genotypic variance in fitness.

1080 KIMURA, M.
Random genetic drift in a triallelic locus: exact solution with a continuous model.
Biometrics 1956 : **12** : 57–66.
A mathematical account is given of the situation of the title. The probability that all three alleles coexist decreases by a factor of $3/2N$ per generation, where N is the population size. The corresponding factor for two alleles is $1/2N$.

1081 LI, C. C.
The concept of path coefficient and its impact on population genetics.
Biometrics 1956 : **12** : 190–210.
An expository account of Sewall Wright's

method for path coefficients is given. The first part of the paper discusses the method in terms of regression analysis and illustrates it by an example. The second part is devoted to the application of the method to population genetics, in particular to inbreeding.

1082 HORNER, T. W.
Full sib and parent offspring correlations in symmetrical random mating populations with the frequency of the more favorable allele the same at all loci.
Iowa St. Coll. J. Sci. 1956 : **31** : 55–64.

Parent-offspring and full-sib correlations are derived for the complementary, duplicate-factor, multiplicative and optimum-number interaction models, assuming random mating and assuming that the frequency of the more favourable allele is the same at all loci but not necessarily ½ (cf. *PBA*, XXVI, Abst. 46).

1083 HORNER, T. W.
The components of variance in symmetrical random mating populations with the frequency of the more favorable allele the same at all loci.
Iowa St. Coll. J. Sci. 1956 : **31** : 67–77.

Components of variance are derived for a symmetrical genetic model, with the relaxed assumption that the gene frequency of the more favourable allele is not necessarily ½ (cf. Abst. 1082). The same four modes of interaction were considered as in the previous abstract.

1084 KIMURA, M.
A model of a genetic system which leads to close linkage by natural selection.
Evolution, NY 1956 : **10** : 278–87.

It is shown that, if a gene pair A_1A_2 is maintained in balanced polymorphism by heterozygote superiority in fitness, a second gene pair B_1B_2, such that A_1 is advantageous in the presence of B_1 but disadvantageous with B_2 and *vice versa* for A_2, will remain polymorphic if linkage is sufficiently close. Under these conditions, natural selection will favour reduction in cross-over frequency.

1085 KEMPTHORNE, O.
The theory of the diallel cross.
Genetics 1956 : **41** : 451–59.

The theory of the diallel cross is investigated. The basis for the cross is taken as a sample of *n* inbred lines obtained from a random-mating population without selection. The following assumptions are made: (1) normal diploid segregation; (2) no reciprocal differences; (3) arbitrary epistasis; (4) arbitrary number of alleles per locus; (5) the parents are homozygous; and (6) phenotypic expression is equal to the sum of a genotypic and environmental contribution, the latter being associated randomly with the genotype.

It is shown that only in the absence of epistasis does the diallel table contribute any useful information on intrinsic population characteristics. Values of genetic interest can be estimated but not by orthogonal analysis of variance.

The assumption of independent distribution of genes between parents implicit in Jinks's analysis of diallel crosses between *Nicotiana rustica* lines of unknown origin (cf. *PBA*, XXV, Abst. 2624) is criticized since the estimated quantities refer to a hypothetical and not to any existent population.

1086 HORNER, T. W.
Parent-offspring and full sib correlations under a parent-offspring mating system.
Genetics 1956 : **41** : 460–68.

Correlations between parent and offspring and between full sibs in the *n*th generation of a mating system in which the offspring of a mating is always mated to the younger parent are derived by means of generation matrix techniques. The correlations are reduced when dominance is present and in early generations may be considerably less than ·5. Biases in the estimate of additive genetic variance of the original random mating population by means of procedures involving the determination of (*a*) the covariance and offspring in the *n*th generation, (*b*) the full sib covariance or (*c*) total genotypic variance are small when gene frequency is close to ·5 for partial or complete dominance. When dominance is present, considerable positive or negative bias may result, depending on whether gene frequency is greater or less than ·5, the bias becoming larger as the degree of dominance increases.

1087 NARISE, T.
Variation and evolution in *Trillium*. III. The breeding system of *Trillium kamtschaticum* Pall. in some natural populations.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 65–81.

The Hardy-Weinberg Law was found to apply, in respect of the pattern of differential segments in the chromosomes, to populations growing in northern Japan. The few exceptions are ascribed to inbreeding or intrapopulational subgrouping.

1088 Thoday, J. M.
Population genetics.
Nature, Lond. 1956 : **178** : 843–44.

Contributions to the symposium on population genetics held at a session of the British Association on 3 September 1956 are summarized. J. M. Thoday opened the meeting with a paper entitled Environmental heterogeneity and the genetic architecture of populations. Drawing attention to the high degree of genetic heterogeneity of outbreeding populations, he pointed out that the adaptive heterozygosity of such populations is maintained at the price of relative infertility since some segregates poorly adapted to the contemporary environmental conditions are unavoidably produced. Some investigators therefore doubt whether long-term selection for heterozygosity may be powerful enough to override short-term selection for fertility. The speaker suggested however that if the nature of environmental heterogeneity is considered, it is possible to postulate that selection for heterozygosity on a relatively short-term basis may be strong. Within a heterozygous context selection will favour individuals capable of withstanding a longer and greater range of environmental conditions imposed by the cyclic type of environmental heterogeneity. The remaining three papers, two of which dealt with *Drosophila*, were concerned with the ability of individuals to maintain organized "normal" development despite internally or externally caused disturbances. The third of these contributions, The stability of meiosis in inbred and crossbred rye, was presented by H. Rees, who described the greater instability shown by homozygotes with respect to chiasma frequency, compared with heterozygotes (cf. *PBA*, XXV, Abst. 2974). Since the average chiasma frequency per plant and range in chiasma frequencies within anthers are under genotypic control, the amount of recombination through chiasma frequency may be adjusted by natural selection.

1089 Hiraizumi, Y.
Evolution and variation in *Trillium*. 1. Random genetic drift in natural populations of *Trillium kamtschaticum* Pall.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 33–48.

Data on the degree of homogeneity in respect of chromosome type of natural Japanese populations are analysed to demonstrate that homogeneity increases with reduction in population size as would be expected if random drift were operative.

1090 Bennett, J. H. & Binet, F. E.
Association between Mendelian factors with mixed selfing and random mating.
Heredity 1956 : **10** : 51–55.

It is shown that when equilibrium is reached in a population undergoing selfing and random crossing at a constant ratio the genes are associated at random on the chromosomes but the heterozygous or homozygous state at one locus is positively associated with the same state at any other linked or unlinked locus, i.e. there is a tendency for heterozygosis to become concentrated in some members of the population.

1091 Griffing, B.
A generalised treatment of the use of diallel crosses in quantitative inheritance.
Heredity 1956 : **10** : 31–50.

"When a diallel crossing system is used in quantitative inheritance for the purpose of estimating genetic parameters of the population from which the inbreds were derived, the following assumptions and conditions must be met: (1) the parent population must be a random mating population in equilibrium; (2) the experimental set of lines must be a random sample from a population by the imposition of an inbreeding system free from forces which change gene frequencies; (3) a 'modified diallel' crossing system must be used in which the lines themselves are not included in the experimental set.

"The additive and non-additive components of the parent genotypic variance are estimated by use of general and specific combining ability components of variance. The exact relationship existing between these two sets of parameters is given using a completely generalised gene model.

"When interpreted in terms of the classical method of covariances between relatives, the method of diallel crosses yields estimates equivalent to those obtained by covariance between parents and offspring.

"Analyses of variance are given which may be used for testing and estimating the population general and specific combining ability variances from experimental material."

In an appendix to the above paper it is demonstrated that the modified diallel crossing system referred to yields unbiased estimates of the population parameters. [Author's summary].

1092 Käfer, E. & Roper, J. A.
Acriflavine resistant mutants of *Aspergillus nidulans*.
Heredity 1956 : **10** : p. 279. (Abst.).

Of three independently obtained single-gene mutations, two, conferring different degrees of resistance to acriflavine and certain other substances, are semidominant, lie at about 23 units distal to the *w* locus and appear to be allelic. A cross involving these two alleles in repulsion gave 0·1% susceptible progeny. The third mutant gene, conferring slight resistance to the same substances, is unlinked to the others and is completely recessive.

Resistance has been studied in haploids and homozygous and heterozygous diploids. The selection of haploid and homozygous resistant segregates from heterozygotes has proved useful in the analysis of mitotic crossing-over and in locating new markers.

1093 de Serres, F. J. (Jun.)
Studies with purple adenine mutants in *Neurospora crassa.* I. Structural and functional complexity in the ad-3 region.
Genetics 1956 : **41** : 668–76.

de Serres, F. J. (Jun.)
The origin of prototrophs in crosses of purple adenine mutants in *Neurospora crassa.*
Ibid. 1956 : **41** : 639–40. (Abst.).

Heterocaryon tests indicated that phenotypically similar purple adenine-requiring mutants derived from the same wild type consisted of two physiologically distinct and complementary groups, A and B. The two groups arose through mutation at closely linked loci, respectively designated *ad–3A* and *ad–3B*, within the *ad–3* region in linkage group I. The following gene order was established: *sex* – *hist*-2 – *ad*-3*A* – *ad*-3*B* – *nic*-2 – *al*-2. In intergroup crosses, the origin of prototrophs was correlated with crossing over in one direction only between closely linked markers whereas in intragroup crosses it was not associated with recombination between such markers.

1094 Payne, J. I., Hartman, P. E., Mudd, S. & Phillips, A. W.
Cytological analysis of ultraviolet-irradiated *Escherichia coli.* III. Reactions of a sensitive strain and its resistant mutants.
J. Bact. 1956 : **72** : 461–72.

Exposure of *E. coli* strain B and its resistant mutants B/r and B/F to ultraviolet radiation was followed in each case first by aggregation of the nuclear chromatin along the axis of the cell, then by growth without cell division and then by formation of filaments. In the resistant strains the changes were less extreme and recovery occurred sooner. Similar cytological responses were observed upon treatment with certain concentrations of furacin and of NaCl.

1095 Stover, R. H.
Behavior of albinism in brown and gray cultures of *Thielaviopsis basicola.*
Canad. J. Bot. 1956 : **34** : 875–79.

At certain temperatures and on favourable media, grey cultures consistently formed albino sectors. Single-spore cultures of these sectors always reverted to the pigmented form. The colonies developing after mass spore transfers were albino, except for a small pigmented area around the centre of inoculation. In many cases, after two or three months, the entire colony had become pigmented. This behaviour of albinism is not explicable in terms of genic mutation, nor is an interpretation based upon an adaptive phenotypic change involving the cytoplasmic enzyme system entirely acceptable. Genic mutation, however, appeared to be the cause of albinism in brown cultures.

1096 Weinberg, R. & Latham, A. B.
Apparent mutagenic effect of thymine deficiency for a thymine-requiring strain of *Escherichia coli.*
J. Bact. 1956 : **72** : 570–72.

A thymine-requiring strain produced streptomycin-resistant mutants at a higher rate when grown in the absence of thymine than when grown in the presence of thymine.

1097 Drake, B.
Evidence for two loci governing para-aminobenzoic acid synthesis in *Neurospora crassa.*
Genetics 1956 : **41** : p. 640. (Abst.).

Requirement of para-aminobenzoic acid depended upon mutation at one of two loci, *pab*-1 and *pab*-2.

1098 Woodward, V. W.
Mutation rates of several gene loci in *Neurospora.*
Proc. nat. Acad. Sci. USA 1956 : **42** : 752–58.

A method of determining both the spontaneous and induced rates of mutation at loci for nutritional requirements is described. Using this procedure, the spontaneous mutation rates of the loci for glutamic acid and citrulline utilization were found to be 0·8 per 10^4 conidia and 0·005 per 10^4 conidia, respectively. Mutation rates at both loci increased with increasing X-ray dosage.

1099 NICKERSON, W. J. & FALCONE, G.
Identification of protein disulfide reductase as a cellular division enzyme in yeasts.
Science 1956 : **124** : 722–23.

A filamentous mutant of *Candida albicans* unable to undergo cell division is deficient in the protein disulphide reductase which participates in cell-wall formation in the normal strain (cf. *PBA*, XXIV, Absts. 2075–6).

1100 HOLLIDAY, R.
A new method for the identification of biochemical mutants of micro-organisms.
Nature, Lond. 1956 : **178** : p. 987.

A rapid method for the identification of biochemical mutants of *Ustilago maydis* and other microorganisms forming discrete colonies on agar is described. Thirty-six possible requirements for single growth factors are tested by means of 12 plates of minimal medium each supplemented with a combination of six of the growth factors.

1101 APPLEYARD, R. K. & WHITFIELD, J. F.
Hereditary defects of temperate bacteriophage.
Nature, Lond. 1956 : **178** : 1235–36.

Mutations *i*1 and *i*2 of prophage carried by lysogenic cells of *Escherichia coli* result in almost complete failure in release of infectious particles when the cells are exposed to radiation. An experiment on recombination indicated that the locus for the *i*1 defect differs from that for *i*2 behaviour. Completely different curves for recombination as a function of time were obtained with infection of an *i*2 lysogen by an *i*1 lysate and infection of an *i*1 lysogen by an *i*2 lysate; the mutations are therefore dissimilar in their physiological consequences. Evidence that the recombining form of *i*1 phage is unstable was also obtained. The phenotype of a bacterium carrying the *i*1 or *i*2 type and a normal prophage liberates infectious particles upon exposure to radiation. This suggests an analogy between the phage defects and recessive lethals of higher organisms.

1102 BRESCH, C. & TRAUTNER, T.
Die Bedeutung des Zweifarb-Nährbodens für genetische Untersuchungen am Bakteriophagen T 1. (**The importance of the two-colour nutrient medium for genetical studies of bacteriophage T 1**).
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 589–94.

By the use of a nutrient medium containing alizarin yellow and water blue, mutants of bacteriophage T1 that were indistinguishable by any other method were identified (cf. *PBA*, Abst. 125). Coloured plates illustrating some of the more important mutants of T1 and heterozygotes resulting from crosses between different genotypes are provided.

1103 GILES, N. H., PARTRIDGE, C. W. H. & GIBBS, J. W.
Genetic and biochemical studies of mutants and revertants in adenine-specific strains of *Neurospora crassa*.
Genetics 1956 : **41** : p. 645. (Abst.).

A series of adenine-requiring mutants was obtained from X-irradiated and control conidia of a wild-type strain. On the basis of heterocaryon and crossing tests, the strains were divided into two groups, E and F, consisting of 10 and 14 mutants respectively. The only previously known mutant (44206, *ad*-4) with a specific requirement for adenine fell into group F. In E mutants the conversion of inosine monophosphate to adenosine monophosphate succinate (AMPS) was blocked whereas in the F group the splitting of AMPS to adenosine monophosphate and fumaric acid did not occur. Activity of adenyl succinase, the enzyme responsible for splitting AMPS, was absent in extracts of F mutants but highly active preparations of this enzyme were obtained from the wild type and E mutants.

Ultraviolet irradiation of conidia of one F mutant induced 15 adenine-independent reverse mutants in which adenylosuccinase activity was restored.

1104 IHLOW, F.
Über die Züchtung penicillinresistenter Bakterien. (**On breeding bacteria resistant to penicillin**).
Albrecht-Thaer-Arch. 1956 : **1** : 168–84.

By subjecting cultures of *Thermobacterium bulgaricum*, *Streptobacterium casei* and *Bacterium acidophilum* to increasing doses of penicillin, mutant strains possessing a high degree of resistance to this antibiotic were obtained in experiments at the Dairy Institute of the Faculty of Agriculture and Horticulture of the Humboldt University, Berlin.

1105 NAYLOR, H. B. & BURGI, E.
Observations on abortive infection of *Micrococcus lysodeikticus* with bacteriophage.
Virology 1956 : **2** : 577–93.

Strains of *M. lysodeikticus*, produced by ultraviolet irradiation, were found to be capable of producing plaques with virulent phage N6 but not with serologically related virulent phage N1, although this phage was efficiently adsorbed and the bacteria were therefore not truly resistant. When mutant cells were simultaneously infected with both phages apparent reversal of abortive infection was observed and between 50 and 60% of the infected cells produced infectious phage. Most cells yielded both parental phage types together with two new stable types in which the plaque morphology and host range of the parental types were recombined. These results are discussed with reference to similar results obtained with *Escherichia coli* (cf. *PBA*, XXVI, Abst. 977).

1106 Tessman, E. S.
Growth and mutation of phage T1 on ultraviolet irradiated host cells.
Virology 1956 : **2** : 679–88.

"The capacity of *Escherichia coli* B/r to yield phages T1 and T3 is more ultraviolet (UV)-sensitive than is the capacity to yield phage T2. The capacity to yield phage from UV-irradiated T1 or T3 is about ten times as UV-sensitive as the capacity for unirradiated phage. The capacity of UV-irradiated host cells for UV-irradiated T2 is the same as for normal T2. UV-irradiated T1 is reactivated on UV-irradiated host cells. When unirradiated T1 is grown on UV-irradiated cells, the frequency of plaque-morphology mutants is the same as the spontaneous frequency. When UV-irradiated T1 is grown on UV-irradiated cells there is about a sevenfold increase in mutant plaque frequency over the spontaneous frequency. Thirty phenotypically distinct plaque-morphology mutants of T1 have been found." [Author's summary].

1107 Oehlkers, F.
Die Auslösung von Mutationen durch Chemikalien bei *Antirrhinum majus*. (**The induction of mutations in *A. majus* by means of chemicals**).
Z. indukt. Abstamm.- u. VererbLehre 1956 : **87** : 584–89.

Of the chemical substances tested, aluminium chloride, nitrogen mustard and ethylurethane-KCl were found to exercise a mutagenic effect upon the pollen mother cells.

1108 Halifman, I.
(**The distinguished French scientist and agrobiologist Lucien Daniel**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 11 : 39–40. [Russian].

This biography of Daniel, written on the occasion of the centenary of his birth, mentions his experiments on vegetative hybridization with beans, *Helianthus* spp., Solanaceae and fruit trees.

1109 Bateman, K. G.
Experiments on genetic assimilation.
Heredity 1956 : **10** : p. 281. (Abst.).

It is reported that in a number of cases selection of a phenocopy has led to genetic assimilation, i.e. to the production of a genotype tending to condition the spontaneous appearance of the character. Further selection of the assimilated character produced almost true-breeding stocks. Genetical studies indicated that in each case a major gene and penetrance modifiers may be involved, suggesting that incompletely penetrating genes may be of importance in determining the potential direction of assimilation. There was evidence that assimilation was the result of the lowering of the threshold for the expression of a character in the normal environment owing to an increase in the population mean during phenocopy selection.

1110 Ryan, F. J.
Evolution as observed in microorganisms.
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 257–61. [Japanese].

Recent work on the nature of bacterial adaptation and on orthoselection is reviewed.

1111 Hinshelwood, C.
Some interactions of the physical and the biological sciences.
Nature, Lond. 1956 : **178** : 1263–66.

This discussion, which constituted part of the presidential anniversary address presented to the Royal Society on 30 November 1956, includes an account of the evidence which has led the author to conclude from experiments on drug resistance that the bacterial cell may undergo adaptive changes by physicochemical adjustments as well as by mutation.

1112 Briault, P. G.
Cytoplasmic changes associated with adaptation and differentiation.
Nature, Lond. 1956 : **178** : 1223–24.

Asexual spores of a single homocaryotic colony of *Aspergillus glaucus* showed heterogeneity, cytoplasmic in origin, in ability to grow on a medium containing mercuric chloride or a medium in which galactose or xylose had been substituted for sucrose.

1113 Melville, R.
Inheritance of acquired characters.
Nature, Lond. 1956 : **178** : 1210–11.

An account is given of the discussion on the inheritance of acquired characters at a joint meeting of the Linnean Society and the Systematics Society, held in London on 1 November 1956. The discussion was opened by H. Graham Cannon, who was critical of the neo-Mendelian approach to the problem. He expressed the views, for instance, that no true mitosis or meiosis occurs in the Protista and that the homeostatic property of protoplasm is the main evolutionary force. A. C. R. Dean referred to research on bacteria, which favoured the interpretation that the lag phase before growth begins on an altered medium represents a period of enzymatic adaptation and not the time taken by fully-adapted mutants to multiply. R. Melville attempted to link up the situation in unicellular organisms with that in the higher plants and animals by the following hypothesis. The initial changes in the cell in response to environmental alteration are similar in all organisms in that they depend upon existing enzyme systems and alternative metabolic paths. In the higher organisms, the early response is solely phenotypic. With a continuation of the new environmental conditions, after a number of generations an essential molecule or molecules may become attached to a protein molecule in a plasmagene, which may subsequently be incorporated in a nuclear gene. A contribution by C. H. Waddington provided an account of experiments on *Drosophila* in which a phenocopy induced by temperature shock became genetically fixed in untreated flies by selection (cf. *PBA*, XXII, Abst. 1595).

1114 Lebedev, D. V.
(Some remarks concerning the article by I. I. Novinskiĭ on "the philosophical principles for a biological theory of the species").
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 267–71. [Russian].

Criticisms by Novinskiĭ of the conduct of the discussions on evolutionary problems in the *Botaničeskiĭ Žurnal* are commented on. Novinskiĭ is criticized chiefly for his disregard of natural selection.

1115 Nuždin, N. I.
(The views of Darwin and Mičurin on the effect of environment on the variability of organisms).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. biol. : 1956 : No. **2** : 18–28. [Russian].

Mičurinist tenets of inheritance of acquired characters, graft hybridization, directed changes and interspecific conversions are upheld against the arguments of Lysenko's critics in the *Botaničeskiĭ Žurnal* (cf. *PBA*, XXV, Abst. 2656).

EVOLUTION

1116 Muller, H. J.
Man's place in living nature.
Ind. Univ. Publ. 1956 : Pp. 24.

Taking as his thesis the view that "since our own galaxy alone contains tens of billions of suns, and there are more than a million of these galaxies of suns in our view, it is probably a very gross underestimate to say that many trillions of planets besides our own are at this moment serving as the abode of life", the speaker in this lecture considers the basic attribute of living things to be the capacity of the gene for duplication, either in its original or a mutated form. The role of nucleic acid and the significance of its structure are examined, the evolution of complexity and adaptation in plants and animals is traced and some eugenic implications of the processes described are pointed out.

1117 Kozo-Poljanskiĭ, B. M.
(I. V. Mičurin and plant phylogeny).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1956 : **61** : 1–11. [Russian].

Facts contributed by Mičurin to the knowledge of plant phylogeny are said to have been based on Darwin and to conflict with Lysenko's concept of the biological species.

1118 Grant, V.
The influence of breeding habit on the outcome of natural hydridization in plants.
Amer. Nat. 1956 : **90** : 319–22.

It is suggested that where the time available for the reproduction of natural hybrids is critical, as in annual plants, the breeding behaviour of the parental species will operate as a selective mechanism controlling the origin of polyploids, tending towards polyploidy under conditions of self pollination and to introgression under conditions of outcrossing. The author suggests that this may explain the correlation observed between high chromosome counts and small size of flowers.

1119 Oparin, A. I.
The origin of life.
SCR Sov. Sci. Bull. 1956 : **3** : No. 3 : 1–8.

The evolution from the purely organic level, represented by protein molecules, to the living state is envisaged as having taken place via the formation of coacervate droplets and by natural selection acting on these.

CYTOLOGY

1120 Shimotomai, N. & Inoue, S.
(On the length of time of hydrolysis in performing the Feulgen nucleal reaction in plant cytology).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1948 : **61** : 85–86. [Japanese].

The relation between hydrolysis time and optimum staining is elucidated for material treated with four different fixatives.

1121 Zeilinga, A. E.
An improved acetic orcein squash method for serial cytological preparations.
Euphytica, Wageningen 1956 : **5** : 171–74; Meded. Inst. Vered. TuinbGewass. 1956 : No. 86.

The improved technique allows thirty slides, which will keep for one month or longer, to be prepared in one and a half hours. The method involves staining on the slide in a drop of 2% orcein in 45% acetic acid with N HCl added in the proportion 1 : 9 and counterstaining with 0·1% Fast Green FCF in 45% acetic acid.

1122 Kostrjukova, K. Ju. & Gureckaja, F. S.
(So-called cytoplasmic fertilization in plants).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 23–31. [Russian].

Recent cytological research, including the writers' own investigations on some higher plants at Kiev, is surveyed. No penetration of the somatic tissues surrounding the ovule by the male sex cells was observed by the writers. It is thought, however, that so-called "surplus" pollen grains may be assimilated by the maternal tissues and provide nutrients for the embryo and endosperm. But this is regarded as a separate process from that of the fusion of the male gemetes with the egg-cell nucleus and the polar nuclei.

1123 Moses, M. J.
Studies on nuclei using correlated cytochemical, light, and electron microscope techniques.
J. biophys. biochem. Cyt. 1956 : **2** : No. 4 : Suppl. Pt. 2 : 397–406.

A technique for comparing nuclear sections to be studied under (1) the electron microscope and (2) after Feulgen staining under the light microscope is described. The method involves the use of adjacent thin and thick sections, the first for the electron and the second for the light microscope. It was shown that the apparent nuclear homogeneity under the electron microscope was not due to loss or redistribution of DNA.

1124 Schmitt, F. O.
Patterns of interaction of biological macromolecules in relation to cell function.
Proc. nat. Acad. Sci. USA 1946 :**42** : 806–10.

Cf. Abst. 1126.

1125 Ris, H.
A study of chromosomes with the electron microscope.
J. biophys. biochem. Cyt. 1956 : **2** : No. 4 : Suppl. Pt. 2 : 385–92.

Electron micrographs of chromosomes from diverse sources suggest that the units out of which the chromosomes are built are microfibrils 200 Å thick. These are associated in pairs at prophase. After treatment with DNase, the microfibrillar structure remains. It is suggested therefore that the microfibrils consist of a DNA core surrounded by a protein sheath.

1126 Schmitt, F. O.
Chromosomes, genes and macromolecular systems.
Nature, Lond. 1956 : **177** : 503–05.

Since protein macromolecules such as collagen aggregate to form various types of periodic banded fibre according to experimental conditions, it is suggested that the aperiodic banding of the chromosomes may result from specific types of aggregation of a comparatively limited number of protein and DNA species. It would be necessary to assume that the cell be capable of maintaining a highly specific chemical environment for chromosome synthesis but it would not be necessary to postulate that the chromosome be replicated as a whole. The gene may correspond to a specific juxtaposition of chemical groups on two or more adjacent macromolecules.

1127 Steffenson, D., Anderson, L. F. & Kase, S.
Crossing over studies with *Drosophila* and maize.
Genetics 1956 : **41** : p. 663. (Abst.).

Since the results of investigations on the effects of mineral deficiency upon breakage in *Tradescantia* led to the hypothesis that metal ions may bind together the macromolecular constituents of the chromosome (cf. *PBA*, XXV, Abst. 2684 and XXVI, Absts. 74 and 894), the nutritional experiments have been extended to the study of crossing over. The frequency of crossing over was increased in *Drosophila* by chemical means, notably by feeding larvae with ethylenediamine tetraacetic acid. Culture of maize plants in quartz sand with Hoagland's solution containing a low concentration of Ca did not result in any differences in frequency of crossing over within the region *C–Sh–Bz–Wx*, compared with plants grown with an optimum supply of Ca. Limitation of nutritional techniques in investigations of crossing over are mentioned.

1128 PLAUT, W. & MAZIA, D.
The distribution of newly synthesized DNA in mitotic division.
J. biophys. biochem. Cyt. 1956 : **2** : 573–87.

A detailed account is given of investigations which have indicated that the parental deoxyribonucleic acid (DNA) in the mitotic chromosomes of *Crepis capillaris* is not equally distributed among the daughter chromosomes (cf. *PBA*, XXVI, Abst. 1978). An attempt is made to translate the pattern of new DNA distribution into a probable number of units of synthesis per anaphase chromosome. In addition, the problem of the mode of duplication of the whole chromosome is discussed in terms of various hypotheses of the reproduction of DNA molecules.

1129 DONOHUE, J. & STENT, G. S.
An identical duplex structure for polynucleotides.
Proc. nat. Acad. Sci. USA 1956 : **42** : 734–36.

A possible alternative for the Watson-Crick structure of DNA is proposed in which the two polynucleotide helices are composed of the same sequence of bases, each base being linked to its identical partner, e.g. guanine-guanine, by two hydrogen bonds.

1130 PAULING, L. & COREY, R. B.
Specific hydrogen-bond formation between pyrimidines and purines in deoxyribonucleic acids.
Arch. Biochem. Biophys. 1956 : **65** : 164–81.

From a detailed consideration of the data on the atomic configuration of pyrimidines and purines provided by crystal analysis, the authors find that while the adenine and thymine molecules in the Watson-Crick structure for DNA would be linked by two hydrogen bonds, the cytosine and guanine molecules would be linked by three such bonds.

1131 SATO, D.
(The phylogeny of the caryotype with special reference to the origin of living things).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1950 : **63** : 189–97. [Japanese].

Data on the chromosomes of lower plants are assembled and used as the basis for a discussion on the origin of life and on the course of caryotype evolution.

1132 SHAW, G. W.
The preparation of chromosomes.
Microscope 1956 : **11** : 43–45.

In a previous paper the author gave details of a method of crystal-violet staining, using Cellosolve as a dehydrating agent (cf. *PBA*, XX, Abst. 1428). He now describes a modification of this technique and extensions of the method to Feulgen and acetic staining.

1133 NELSON, R. R.
Transmission of factors for urediospore color in *Puccinia graminis* var. *tritici* by means of nuclear exchange between vegetative hyphae.
Phytopathology 1956 : **46** : 538–40.

This is a detailed account of work reported in *PBA*, XXVI, Abst. 2101.

1134 NORDENSKIÖLD, H.
The effect of X-ray treatment in dormant seeds of *Luzula pallescens* and *L. capitata*.
Kungl. LantbrHögskolans Ann. 1956 : **22** : 257–67.

Normal germination and seedling survival occurred in the above species at dosages up to 150,000 r. Growth was retarded and fertility reduced at this level of treatment but both were almost normal at 40,000 r. This high tolerance of X-ray doses is attributed to the possession of a diffuse centromere. An examination of the somatic chromosomes of treated *L. capitata* showed that, although plants exposed to 30,000–80,000 r. showed increasing numbers of fragments and long reunited chromosomes, no bridges or lagging chromosomes were present at anaphase. Polyploidy did not appear to increase the tolerance as much as in some species with monocentric centromeres (cf. *PBA*, XII, Abst. 159), the 50% mortality level occurring at 200,000 r. in an artificial tetraploid of *L. pallescens* compared with 160,000–180,000 r. in the diploid.

1135 WILSON, J. Y.
The assumed function of the kinetochore.
Genetica 1956 : **28** : 223–30.

Studies carried out on root-tip cells, pollen mother cells and pollen grains of *Endymion nonscriptus* and *Scilla sibirica* showed that both the centromere and chromatids were already divided at mitotic prophase and metaphase and at meiotic prophase II. The sister chromatids remained closely associated along their whole length during mitotic prophase and separated from the distal ends inwards, as division proceeded. At meiotic prophase II only the proximal portions of the chromatid arms were associated.

1136 KAUFMANN, B. P. & DE, D. N.
Fine structure of chromosomes.
J. biophys. biochem. Cyt. 1956 : **2** : No. **4** : Suppl. Pt. 2 : 419–24.

Electron micrographs of prophase in the staminal hairs of *Tradescantia reflexa* revealed that the chromosome is composed of as many as 64 strands, probably arranged in hierarchic pairs. The helices of the smallest units were 125 Å. in diameter and appeared to consist of a sheath 40 Å. thick surrounding a less dense core.

1137 LEVINTHAL, C. & THOMAS, C. A. (JUN.)
Evidence for the maintenance of the physical integrity of the chromosome of phage.
Genetics 1956 : **41** : 650–51. (Abst.).

The progeny of crosses between P^{32}-labelled bacteriophage of one genotype and nonradioactive phage of another showed phenotypic mixing, as indicated by a host-range marker. When the progeny were allowed to grow through a second transfer at a low multiplicity of infection, phenotypic mixing no longer occurred. After the second transfer, the phage particles were separated according to their phenotype for adsorption; those particles with high P^{32} content per particle were primarily in the fraction with the same phenotype as the labelled parent. A large piece of DNA associated with the host-range marker was therefore transmitted intact to the phage progeny. If further experiments show that other markers are associated with this piece of DNA, it may be concluded that it represents the phage chromosome. Since the piece was apparently transmitted intact, the authors suggest that in phage a process involving the joining together of partial replicas of the parental structures may be responsible for the production of recombinants, instead of crossing over.

1138 SPRINGALL, H. D.
Chromosome problems.
Nature, Lond. 1956 : **178** : 782–84.

An account is given of a conference on chromosomes held in the Landbouwhogeschool, Wageningen, Netherlands, during April 1956. E. Heitz spoke first on chromosome structure in mitosis and meiosis. H. D. Springall discussed the chemical structure of proteins and nucleic acids. T. Caspersson examined the problems of cytochemical analysis of the nuclear components. N. W. Pirie dealt with the recognition, distribution and action of nucleic acids. Å. Gustafsson spoke on the experimental control of mutation. A. Müntzing discussed chromosomes in relation to species differentiation and plant breeding. The concluding lecture was given by C. D. Darlington who considered the means of co-ordination between the activities of the constituents of the cell.

1139 EISENSTARK, A. & KIRCHNER, C.
Genetic effects of chelation on phage-bacterial systems and on bacteria alone.
Genetics 1956 : **41** : 640–41. (Abst.).

Treatment with the chelating agent ethylenediamine tetraacetic acid resulted in an increased frequency of recombination and transduction in *Escherichia coli* and of phage mutation.

1140 ARUN KUMAR SHARMA & SANTOSH KUMAR SARKAR
Cytological basis of differentiation in palms.
Sci. & Cult. 1956 : **22** : 175–76.

Observations on adult cells of species of *Borassus*, *Oreodoxa*, *Attalea* and other palms in which division was induced, suggested that partial endomitosis involving only a certain number of the chromosomes may be responsible for the differentiation of adult cells into the tissue of specific organs.

1141 WOLFF, S. & LUIPPOLD, H. E.
Obtaining large numbers of metaphases in barley root tips.
Stain Tech. 1956 : **31** : 201–05.

A technique is described which brings a large number of cells to metaphase so that scoring of radiation-induced chromosome aberrations can be carried out. Irradiated seeds are germinated in 0·2% colchicine which destroys the spindle and prevents cell division from proceeding beyond the metaphase stage. After fixation in Carnoy's **6 : 3 : 1** the middle lamella is digested by 4–5% pectinase which allows the cells to be separated and flattened.

1142 WADA, B.
(The influence of colchicine on the duration of mitosis).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1948 : **61** : 15–16. [Japanese].
Cf. *PBA*, XX, Abst. 2083.

1143 WADA, B.
(The effect of penicillin on mitosis in plants).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1948 : **61** : p. 84. [Japanese].
Cf. *PBA*, XX, Abst. 1385.

1144 SHARMA, A. K. & SARKAR, S. K.
Veratrine: its use in cytochemistry.
Caryologia 1956 : **8** : 240–49.

In studies of the effects of solutions of Veratrine, a mixture of unspecified alkaloids, upon root-tip mitosis in *Allium cepa*, *Vicia*, *Lens* and other material, no effects were observed at concentrations below 0·001% while extreme clumping of the chromosomes occurred above about 0·9%. Information is given on the concentrations and lengths of treatment required to induce (*a*) certain changes in plasma viscosity allowing chromosome constrictions to be distinguished readily and thus facilitating caryotype analysis, (*b*) polyploidy and (*c*) a single chromatid break.

1145 NICKERSON, W. J., TABER, W. A. & FALCONE, G.
Physiological bases of morphogenesis in fungi. 5. Effect of selenite and tellurite on cellular division of yeast-like fungi.
Canad. J. Microbiol. 1956 : **2** : 575–84.

Addition of an aqueous solution of sodium selenite or potassium tellurite to the medium stimulated division in a filamentous mutant of *Candida albicans* (cf. Abst. 1099) and in normally filamentous cells of this species and members of other genera. A mutant (RM806) highly resistant to sodium selenite was isolated from the filamentous variant of *C. albicans*. Unlike its parent, RM806 grew almost completely as a budding form, even in the absence of selenite. Its ability to grow rapidly in the presence of high concentrations of sodium selenite did not appear to be directly related to its marked selenite-reducing capacity.

1146 DAS, N. K., PATAU, K. & SKOOG, F.
Initiation of mitosis and cell division by kinetin and indoleacetic acid in excised tobacco pith tissue.
Physiol. Plant. 1956 : **9** : 640–51.

Many mitoses, most of which were followed by cell division, were induced in excised pith when both kinetin (6-furfurylaminopurine) and indoleacetic acid (IAA) were added to the culture medium. In the absence of IAA no mitoses occurred while with IAA alone a small number of mitoses was seen, few of which were followed by cytokinesis.

1147 GANGULY, D. N. & ARUNABHA DUTTA
The cytochemical effect of m-xylohydroquinone and m-xyloquinone (dimerised) on *Allium cepa* L.
Caryologia 1956 : **8** : 361–69.

The effects of various concentrations (0·0005 M to 0·01 M) of m-xylohydroquinone upon onion root-tip cells was studied, the periods of treatment ranging in length from 1 to 72 hours. At very low dosages, the detailed structure of metaphase chromosomes became very distinct and with successively higher doses increasing amounts of fragmentation, bridge formation, c-mitosis, pycnosis and inhibition of cell division were observed. The m-xyloquinone was less toxic in effect than the m-xylohydroquinone.

1148 CONGER, A. D., RANDOLPH, M. L. & JOHNSTON, A. H.
Chromosomal aberration production by X-rays and by monochromatic 2.5-Mev and 14-Mev neutrons.
Genetics 1956 : **41** : p. 639. (Abst.).

In experiments on *Tradescantia* inflorescences, the more densely ionizing 14-Mev D,T neutrons [LET (linear energy transfer), 15 kev/μ] caused on the average about twice as much chromosomal damage as X rays (LET, 2·6 kev/μ). The still more densely ionizing 2·5 Mev D,D neutrons (LET, 39 kev/μ) were however twice as damaging as the D,T neutrons or four times as damaging as the X rays. In comparing X rays and neutrons with respect to their efficiency in producing chromosomal aberrations, the neutron-energy distribution should therefore be taken in account.

1149 FETNER, R. H.
A study of factors affecting X-ray-induced chromosome aberrations in the microspores of *Tradescantia paludosa*. I. Fractionation of dosage in helium, air, and oxygen.
Radiation Res. 1956 : **4** : 510–18.

A study was made of the numbers of chromosome exchanges and deletions per cell observed after X irradiation of the microspores with two doses of 200 r. separated by 0–10 hr. Aberration frequencies not significantly different from those produced by a continuous dose occurred with interdose periods of 7 hr. when the irradiation was performed in helium, of 9 hr. in air and of 10 hr. in pure oxygen. A cyclic rise and fall in aberration frequency with the hourly increments of the interdose period was observed after irradiation in air, and it is suggested that this may account for certain discrepancies found among the results of other workers.

1150 Wolff, S. & Luippold, H. E.
Inaccuracy of measuring X-ray-induced chromosomal damage by scoring at anaphase.
Genetics 1956 : **41** : 666–67. (Abst.).

Both dry and soaked seeds of barley were irradiated with various doses of 250 kvp X rays. The first mitotic division upon germination was scored for dicentrics and rings in one half of the seeds and for anaphase bridges in the other half. The dose-response curve obtained for the metaphase figures was of the parabolic two-hit type but the frequency of anaphase bridges increased linearly with dose.

1151 Angulo Carpio, M. D.
Acción de agentes físicos en citogenética. (**Action of physical agents in cytogenetics**).
Genet. iber. 1956 : **8** : 53–69, 133–44.

A select list of bibliographical references is presented on the effects of X rays, ultraviolet rays, γ rays, neutrons and various other types of radiation, including atomic bombs and nuclear explosions.

Part II comprises references to various other agencies such as centrifuging, temperature and ultrasonic vibrations, separately and in combination.

1152 McQuade, H. A., Friedkin, M. & Atchison, A. A.
Radiation effects of thymidine-2-C^{14}. I. Uptake of thymidine-2-C^{14} and thymine-2-C^{14} in the onion root tip. II. Chromosome aberrations caused by thymidine-2-C^{14} and thymine-2-C^{14} in the onion root tip.
Exp. Cell Res. 1956 : **11** : 249–64.

It has been shown that thymidine is utilized for DNA synthesis in the meristematic cells of the root tips of onion seedlings but that thymine is virtually unused. Chromosome aberrations were observed in roots treated with thymidine-2-C^{14} and thymine-2-C^{14} but the former gave significantly higher aberration frequencies than the latter and higher numbers of aberrations with increased length of exposure.

1153 Meletti, P.
Reazioni citologiche indotte, in *Allium cepa* L., da alcune soluzioni tampone. (**Cytological reactions induced in *A. cepa* L. by some buffer solutions**).
Caryologia 1956 : **8** : 231–39.

A series of buffer solutions (*a*) NaH_2PO_4 + Na_2HPO_4, (*b*) phosphoric acid + acetic acid + boric acid + NaOH and (*c*) KH_2PO_4 + NaOH, with pH values ranging from 5 to 8, were applied to root tips of *A. cepa*. Stickiness, c-mitosis, mitostatic action and lethal effects apparently due to dehydration were noted.

1154 Read, J. & Kihlman, B. A.
Comparison of the effects of 8-ethoxycaffeine and X-rays on the cytology and growth of roots of *Vicia faba*.
Hereditas, Lund 1956 : **42** : 487–507.

Modification in the frequencies of chromosome aberrations induced by 8-ethoxycaffeine (EOC) alone were obtained by various treatments with oxygen, H_2O_2, sodium azide and dinitrophenol at 10° C. and were found to be parallel to the effects of the same treatments upon root growth. A close quantitative agreement was also revealed between the frequency of aberrations and reduction in growth caused by either X rays or EOC. An analysis of growth rates after treatment with X rays, α rays, EOC, nitrogen mustard or triethylene melamine indicated that the onset of inhibition in growth was correlated with the interphase sensitivity of the chromosomes to breakage. The effectiveness of the dose decreases proportionally in the same way in extended treatments with X rays and EOC, presumably as the result of biological factors.

1155 Martinez-Pico, L. M. & Duncan, R. E.
The structural chromosome aberrations produced by 5-aminouracil and their prevention by an additional thymine source.
Cytologia, Tokyo 1955 : **20** : 378–91.

A full account is given of work on *Vicia faba* root tips, summarized from an earlier brief report in *PBA*, XXIV, Abst. 1591.

1156 Kihlman, B. A.
Factors affecting the production of chromosome aberrations by chemicals.
J. biophys. biochem. Cyt. 1956 : **2** : 543–55.

Investigations were carried out on the effects of temperature, H ion concentration and oxygen upon the induction of aberrations by maleic hydrazide (MH), di-(2,3-epoxypropyl) ether (DEPE) and 8-ethyxocaffeine (EOC) in root tips of *Vicia faba*. A rise in temperature from 3° to 25° C. resulted in a marked increase in the frequencies of aberrations produced by MH and DEPE. The effect of EOC in inducing aberrations increased with rising temperature up to 12° C. but with a further rise decreased, so that at 25° C. it was about the same magnitude as at 3° C. Variations in H ion concentration did not significantly influence the effect of DEPE or EOC; that of MH was however considerably reduced by raising the pH from 4·7 to 7·3. The effect of EOC was completely inhibited and that of MH partly so by the following conditions during treatment: (1) exclusion of oxygen from the solution, (2) inhibition of respiration by azide or cyanide and (3) uncoupling of phosphorylation from respiration by the action of 2,4-dinitrophenol (DNP). Pretreatment with DNP had a similar influence but posttreatment did not alter the frequencies of aberrations. The effect of DEPE was not changed by anoxia. Pretreatment or posttreatment with DNP did not modify the total number of aberrations induced by DEPE but the appearance of the effect was considerably delayed.

1157 Davidson, D.
Comparative sensitivity of mitotic stages.
Heredity 1956 : **10** : p. 439.

"Chromosome breaks and reunions induced by X-rays were scored in 4*x* nuclei derived from 2*x* nuclei after colchicine treatment and it was shown that metaphase is the most sensitive stage.

"Breaks per chromosome recovered at the following mitosis are more frequent in 4*x* nuclei after irradiation of prophase, metaphase or telophase than 2*x* nuclei found in the same samples owing to the fact that the 2*x* nuclei are not accurately timed and include less sensitive resting stage samples. On the other hand, breakage is less frequent in 4*x* nuclei than in 2*x* nuclei after irradiation in resting stage. This may perhaps be due to a genuine physiological difference between the two types of nuclei."

[Author's summary].

1158 Wolff, S. & Luippold, H. E.
The production of two chemically different types of chromosomal breaks by ionizing radiation.
Proc. nat. Acad. Sci. USA 1956 : **42** : 510–14.

Experiments on X-irradiated seeds of *Vicia faba* indicated that induced chromosome breaks may be of two types: ionic and covalent. The former type rejoins very rapidly, but the latter remains open for longer periods, a source of energy being required for the biosynthesis of the bonds formed when rejoining occurs. It is suggested that data reported on the effects of Ca deficiency, chelating agents, metabolic inhibitors and high-intensity radiation may be unified by this concept of two types of chromosomal damage.

1159 Cohn, N. S. & Gibbs, J. W.
An analysis of the rejoining of X-ray induced broken ends of chromosomes.
Genetics 1956 : **41** : p. 639. (Abst.).

Experiments on X-irradiated seedling roots of *Allium cepa* revealed that some broken ends rejoined within about 15 minutes whereas other breaks remained open for as long as 4 hours. Further investigations have been undertaken to test the hypothesis that the two classes of break are respectively ionic and covalent.

1160 Phillips, L. L.
Effect of free radicals on chromosomes of barley.
Science 1956 : **124** : 889–90.

Treatment of dormant seeds of the barley Himalaya with H_2O_2 was ineffective in causing breakage but treatment with $H_2O_2 + Fe_2(SO_4)_3$ was highly effective, indicating that the free radicals derived from the catalytic splitting of the H_2O_2 molecule and not H_2O_2 *per se* caused breakage. The proportions of chromosome and chromatid breaks were typical of the effects of X radiation.

1161 Anderson, L. F. & Steffensen, D.
Tube nucleus divisions in *Tradescantia* pollen associated with a translocation.
Genetics 1956 : **41** : p. 633. (Abst.).

In a seedling mutant of *T. paludosa*, division of the tube nucleus, followed by pollen abortion, was associated with segregation of a translocation.

1162 Rutishauser, A.
Genetics of fragment chromosome in *Trillium grandiflorum*.
Heredity 1956 : **10** : 195–204.

Crosses between plants with single fragment chromosomes on the one hand and plants with or without such fragments on the other showed that when the fragment was carried by the male parent only, the F_1 endosperms with and without fragments occurred in a 1 : 1 ratio, while if the fragments were carried by the female, there was a preponderance of endosperms with two or three fragments. It is thought that this is the result of directed distribution of univalent fragments at meiosis in embryo mother cells towards the cell forming the embryo sac. Such a mechanism would afford a method of maintaining B chromosomes in wild populations. There was some evidence that the presence of B chromosomes may exert a favourable influence upon seed fertility.

1163 Battaglia, E.
The concept of pseudopolyploidy.
Caryologia 1956 : **8** : 214–20.

The term pseudopolyploidy is advocated to describe conditions in which different degrees of polyploidy in a taxon arise either by successive fragmentations of a small number of large polycentric chromosomes to form a large number of small chromosomes or by successive fusions of many chromosomes to form few. The former type is designated breakage pseudopolyploidy and is exemplified by *Parascaris equorum* and *Luzula* while the latter is termed fusion polyploidy and is thought to occur in *Spirogyra*.

1164 Castro, D. & Noronha-Wagner, M.
Nota sobre autopoliploidia induzida em *Luzula campestris* DC. (**Note on induced autopolyploidy in *L. campestris* DC**).
Agron. lusit. 1956 : **18** : 123–26.

Tetraploid plants ($4n = 24$) induced by colchicine treatment, in addition to having broader and thicker leaves, proved more susceptible to an unidentified fungus. Meiosis was relatively regular and fertility complete.

1165 Sybenga, J.
The significance of colchicine from *Colchicum autumnale* L. for the induction of polyploidy in nature.
Genetica 1956 : **28** : 217–22.

Plants of various grass, clover and other species growing amongst old colonies of *C. autumnale* in the Netherlands did not differ in chromosome number from those in similar areas free from *C. autumnale*. It is concluded that under natural conditions colchicine is of limited significance in the induction of polyploidy.

1166 Heuts, M. J.
Toevalstheorie in erfelijkheids- en evolutieleer. (**The theory of chance in heredity and evolution**).
Genen en Phaenen 1956 : **1** : 2–18.

Causality and chance at the molecular level are discussed in relation to the nature of life, mutation and evolution. A concept of the organism as an entity in a 5-dimensional manifold with three spatial and one temporal coordinate and one coordinate representing dependence on external conditions is developed. Recent views on the nature of life are examined against this conceptual framework.

1167 Mills, P. G. & Raper, J. R.
Recovery of the component strains from dikaryotic mycelia.
Mycologia 1956 : **48** : 484–94.

The component homocaryotic strains of such basidiomycetes as *Corticium effuscatum*, *Polyporus* spp. and *Schizophyllum commune* could be recovered by culture in the presence of sodium taurocholate or cholic acid.

1168 Britikov, E. A.
(**Physiological and biochemical analysis of pollen germination and pollen tube growth in the tissues of the pistil**).
Trud. Inst. Fiziol. Rasten. K. A. Timirjazev (Proc. Timirjazev Inst. Pl. Physiol). 1954 : **8** : No. 2 : 3–58. [Russian].

Physiological and biochemical interactions between the pollen and female tissues in the Gramineae, Rosaceae, Cruciferae, Cucurbitaceae, Grossulariaceae, Malvaceae, Labiatae, Liliaceae and other families were investigated and the results, together with those of research by other writers, are discussed from the viewpoint of Mičurinist genetics.

1169 Brock, R. D.
Cytological barriers in plant breeding.
J. Aust. Inst. agric. Sci. 1956 : **22** : 180–88.

The various cytological defects which may result in the failure of crosses before or after fertilization and in the failure of growth or reproduction in the F_1 plant are described.

1170 Steiner, E.
New aspects of the balanced lethal mechanism in Oenothera.
Genetics 1956 : **41** : 486–500.

On the basis of the results of numerous crosses effected in the *biennis* group 1, it is suggested that the α genome, which is transmitted entirely or predominantly through the egg, carries an incompatibility mechanism of the *Nicotiana* type, while the β complex, transmitted mainly through the pollen, does not. Such an incompatibility mechanism, together with megaspore competition, would constitute a balanced lethal mechanism resulting in the perpetuation of true-breeding complex heterozygotes.

1171 Ostapenko, V. I.
(The question of estimating different methods of determining pollen viability).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 2 : 38–41. [Russian].

Lower values were obtained from germinating pollen of various fruit trees in sucrose solutions than by acetocarmine coloration or the method of estimating the peroxidase, especially in pollen that had been stored for several months, and the last two methods are regarded as only of relative value in determining pollen viability.

ECONOMIC LOWER PLANTS

1172 Czen Č.-K. [Cheng, C.-K.] & U Č.-Ju. [Wu, C.-Y.]
(The cultivation of *Laminaria japonica* and the problems connected with it).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 182–91. [Russian].

This report on Chinese experiments on culturing *L. japonica* and other edible seaweeds mentions hybridization work between *Laminaria* forms from Dairen and Tsingtao.

1173 Sermonti, G.
Complementary genes which affect penicillin yields.
J. gen. Microbiol. 1956 : **15** : 599–608.

In a continuation of the work described in *PBA*, XXVI, Abst. 2021 four additional mutant genes have been found, P_5, P_6, P_7 and P_8, all allelic at the same locus with P_1, P_2, P_3 and P_4 previously described, and a mutation at a second locus, P_9, which exerts an effect on conidial colour in addition to partial suppression of penicillin-producing capacity in the haploid. A complete cycle of parasexual recombination has been observed with the heterozygous diploid strain XXIX ($65pr\ y_3\ p_2/163\ ly\ p_9$). The wild-type alleles at the two loci, P_2 and P_9, restore penicillin production if both are present in a diploid mycelium, either in the heterokaryotic or heterozygous condition, but not if they are present in different mycelia in a mixed culture. A further increase in production occurs if both dominant alleles are present in the same haploid nucleus.

1174 Curtis, R. W., Stauffer, J. F. & Backus, M. P.
Acenaphthene-requiring strains of *Penicillium chrysogenum.*
Amer. J. Bot. 1956 : **43** : 594–600.

A detailed account is given of mutants already referred to in *PBA*, XXVI, Abst. 95. Penicillin production by the acenaphthene-requiring variants was higher in the presence of acenaphthene than in its absence, but lower than in the parent strain.

1175 Alihanjan, S. I. & Borisova, L. N.
(Vegetative hybridization of fungi of the genus *Penicillium*).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. biol. 1956 : No. 2 : 74–90. [Russian].

An account of vegetative hybridization at the Antibiotics Institute between different strains and species of *Penicillium* is given. The method consisted of inducing anastomoses between the conidia of two different strains. The new forms remained constant and did not segregate in the F_2. The greater the differences between the initial strains, the more difficult was it to obtain hybrids and the more extensive the resulting changes. Among the hybrid forms selected was a strain which multiplied more rapidly than any other penicillin-producing strain at the institute.

1176 Rainbow, C.
Yeast in industry.
Nature, Lond. 1956 : **178** : 966–68.

An account is given of the symposium on Recent studies in yeast and their significance in industry, sponsored by the Society of Chemical Industry and held in Dublin during September 1956. Genetical aspects were the subject of two of the 13 papers. R. B. Gilliland assessed progress so far made and possibilities in Yeast genetics in industry. In a paper on Some genetical aspects of panary fermentation, R. R. Fowell reported that the results of 1 hr. volume fermentometer tests on standard doughs fermented by yeasts obtained by breeding were explicable in terms of four major dominant genes for fermentative capacity but that the results of the 1–3 hr. test were complicated by the action of genes operating "negatively". He concluded that detailed genetical analysis of the haploid parents is necessary before the performance of individual hybrids may be predicted.

1177 Nečas, O.
Vícejaderné kvasinky. **(Multinuclear yeast cells).**
Čsl. Biol. 1956 : **5** : 71–78.

Strains with multinucleate cells (up to ten-nuclei per cell) were obtained from yeast cells developed by regeneration from samples that had been subjected to grinding. The increased number of nuclei in these cells was a heritable characteristic. The cells divided mainly in the normal way, but sometimes the nucleus divided without division of the cell.

1178 Burns, V. W.
X-ray-induced division delay of individual yeast cells.
Radiation Res. 1956 : **4** : 394–412.

X-irradiation at 1000–10,000 r. of diploid cells immediately before division led to a slight delay in the first and a marked delay in the second division after irradiation, the mean length of delay of the second but not of the first being a function of $1-e^{-kD}$, where D is the dose. When diploid cells were irradiated during division, the first division after treatment was delayed while the second was nearly normal. The mean delay of the first division was linearly proportional to the dose. Cells irradiated during division required five to six times as great a dose as nondividing cells to produce the same delay. Haploid cells were less sensitive than diploid cells to the delaying effect of radiation while tetraploid cells resembled the diploid material. It is suggested that delay is caused by damage to the same cell organelles as those responsible for the lethal effects of radiation, but that the damage causing delay is qualitatively different from the damage causing lethality.

1179 Leupold, U.
Tetraploid inheritance in *Saccharomyces*.
J. Genet. 1956 : **54** : 411–26.

Two asci showing aberrant segregation ratios are discussed, one from the cross P3/14c (α *AD ur met*) x 175/6bp$_1$ (*a ad UR MET*) and the other from L–167/3a (α *AD his try g*) x 175/6bp$_1$ (*a ad HIS TRY G*). It is inferred, in each case, that the segregation ratios point to reduction from tetraploids which had presumably arisen by chromosome doubling in the original diploid hybrid cultures. Close linkage between the centromere and the mating type locus (*a* α) and between *HIS* and *TRY* was indicated.

1180 Barnett, J. A., Ingram, M. & Swain, T.
The use of β-glucosides in classifying yeasts.
J. gen. Microbiol. 1956 : **15** : 529–55.

At the Low Temperature Station, Cambridge, an investigation has been carried out on the β-glucosidase activity of 119 yeast strains, including species of *Candida*, *Cryptococcus*, *Debaryomyces*, *Hansenula*, *Kloeckera*, *Pichia*, *Rhodotorula*, *Saccharomyces*, *Schizosaccharomyces*, *Sporobolomyces*, *Torulopsis*, *Trichosporon* and *Zygosaccharomyces*. Esculin, arbutin, salicin or cellobiose were used as substrates but since not all the strains tested were able to hydrolyse all four β-glucosides the possession of different enzymes by different strains is suggested. It is thought that under suitable conditions most species can hydrolyse esculin.

1181 Roberts, C.
The inheritance of enzymatic characters in yeasts.
Friesia 1956 : **5** : 161–79.

Work carried out since 1935 on the genetics of yeast enzymes, particularly of fermentation enzymes, is surveyed and different theories regarding the causes of irregular segregation ratios of tetrads are reviewed, special reference being made to the work and views of Lindegren (cf. *PBA*, XXIII, Abst. 1742) and Spiegelman (cf. *PBA*, XXI, Abst. 859) and those of Winge and the author, who, in contrast to the above-mentioned authors, have found that all their results may be interpreted on a Mendelian basis.

1182 Leupold, U.
Versuche zur genetischen Klassifizierung adenin-abhängiger Mutanten von *Schizosaccharomyces pombe*. (**Experiments on the genetical classification of adenine-requiring mutants of *S. pombe***).
Arch. Klaus-Stift. VererbForsch. 1955 : **30** : 506–16.

Strains of *S. pombe* requiring adenine for normal growth were obtained by ultraviolet irradiation; of the 53 mutants studied, 25 produced a red pigment and proved capable of utilizing hypoxanthine in place of adenine, 24 formed no pigment but proved capable of utilizing hypoxanthine and four, three of which produced a red pigment, were unable to utilize hypoxanthine. Crosses of these mutant strains with the normal wild type suggested that 8 genes are involved, each of which, in its unmutated form, controls a certain stage or reaction in the synthesis of adenine; the mutation of any one of these genes may result in the inability to synthesize this substance. Production of red pigment may be due to the polymeric effect of some of the mutant genes or to recombination between closely coupled loci; in some mutants, if two genes for adenine synthesis have mutated, the ability to produce red pigment is suppressed.

1183 Wanner, H.
Die Akkumulation von Hypoxanthin durch adenin-abhängige Mutanten von *Schizosaccharomyces pombe*. (**The accumulation of hypoxanthine by adenine-requiring mutants of *S. pombe***).
Arch. Klaus-Stift. VererbForsch. 1955 : **30** : 516–26.

Studies of adenine-requiring mutants of *S. pombe* (cf. Abst. 1182) showed that, whereas most of the mutants in question were able to utilize hypoxanthine in place of adenine, four were unable to do so. Of these four, three accumulated and later excreted hypoxanthine and were reddish in colour and the fourth, which showed no traces of red pigmentation, did not accumulate hypoxanthine.

1184 Royan, S.
Structures revealed by dark ground illumination in living yeast.
Proc. Indian Acad. Sci. 1956 : **44** :171–76.

Examination of living cells of *Saccharomyces cerevisiae* at the nonbudding stage, using dark-ground illumination, showed the vacuole and nucleus to be delimited from each other by well-defined membranes and the nucleus as containing certain structures. These observations are in conformity with those obtained by the phase-contrast microscope.

1185 Evans, H. J.
Chromosomes of the cultivated mushroom.
Nature, Lond. 1956 : **178** : 1005–06.

Examined by means of the squash technique, a variety of *Agaricus campestris* var. *bisporus* cultivated on a commercial scale in Great Britain was found to have a chromosome number of $n = 12$, regular bivalent formation being observed at meiosis. Differences in the chromosome numbers reported may be due to the fact that different strains have been investigated and to inadequacy of the techniques employed.

CROP PLANTS

1186 **Reports from the counties: oat, barley and potato variety trials.**
Mon. Rep. Minist. Agric. N. Ire. 1956 : **31** : 140–44.

The average results of variety trials carried out on the above crops at several centres in Northern Ireland during 1955 are summarized.

1187 Hayward, P. R.
Seventh Report of Trial and Experimental Work carried out at "Throws" Little Dunmow 1954/55. Hasler & Co. Ltd., Dunmow : Pp. 31.

Winter wheat. Further tests are to be carried out on S/1/52, a red-chaffed and red-grained selection of Petit Quin Quin (cf. *PBA*, XXVI, Abst. 115). Selection of Nord Desprez x Holdfast, Petit Quin Quin x Eclipse and Benoist 40 x Eclipse for field characters and grain quality continued.

Vicia faba. Reselection of the winter-bean lines constituting the composite commercial stock Throws (MS) has on the whole failed to improve yielding ability (cf. *loc. cit.*). Progress has been made in the development of lines of spring and winter bean breeding true for red seed.

Berichte und Vorträge der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin. II/1955. 2. Festsitzung und Wissenschaftliche Tagung, 17.–19. Oktober 1955 in Berlin. (**Reports and lectures of the German Academy of Agricultural Sciences, Berlin. II/1955. Second session and scientific meeting, 17-19 October 1955 in Berlin**). 1956 : Pp. 272.

1188 *Stubbe, H. Die Entwicklung der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin und ihre Forschungsarbeiten (1953–1955). [The development of the German Academy of Agricultural Sciences, Berlin, and its research projects (1953–55)]. (pp. 11–45).*

This report includes a brief account of current breeding work on agricultural and horticultural crop plants at the Quedlinburg, Bernburg, Kleinwanzleben, Gross-Lüsewitz, Kloster Hadmersleben, Gülzow-Güstrow, Aschersleben and Marquardt research stations. Mention is also made of the selection of plus trees and breeding work at the Tharandt Forestry Research Station.

1189 *Becker, G. Problematik der Qualitätszüchtung. (Problems in breeding for quality). (pp. 71–98).*

The author gives a general account of current aims in breeding for improved quality in agricultural and horticultural crop plants, with particular reference to sugar beet, radish, vetch, cabbage, kohl rabi, green pepper and peppermint. Special emphasis is placed on laboratory methods of testing for quality, both by means of paper chromatography and chemical analysis. One of the principal difficulties encountered in breeding for improved quality is that this is often followed by increased susceptibility to diseases and insect pests.

1190 *Schick, R. Probleme der Qualitätssteigerung bei Speise- und Futterkartoffeln. (Problems of increasing quality in table and fodder potatoes). (pp. 139–52).*

Desirable breeding aims are listed as being an improvement in the protein content of the potato from its present 2% to 3·5–4%, the development of varieties that do not lose their vitamin C during storage and the selection of varieties with larger and more uniform starch grains for industrial purposes.

1191 MUHIN, N. D.
(The breeding of agricultural crops in the German Democratic Republic).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 3 : 54–58. [Russian].

This survey of breeding work and Mičurinist experiments refers to new varieties of the following crops bred at Bernburg, Petkus, Hadmersleben, Kleinwanzleben, Müncheberg, Gülzow-Güstrow, Hohenturm and Gross Lüsewitz.

Wheat. High yielding spring and winter varieties have been bred, among the latter Hadmersleben II, IV and VIII, all of which show resistance to lodging.

Oat. New productive varieties are listed.

Rye. Moorroggen [Bog Rye] is distinguished by lodging resistance and tolerance of boggy soil. It outyields Petkus from which it was derived. Bernburgskaja Kormovaja [Bernburg Forage] is productive of forage and hardy.

Maize. A hybrid of Golden Bantam x Gelber Badischer Landmais [Yellow Baden Land maize] is outstandingly productive. A single cross between the inbreds of Peffonder Goldflut [Peffond Golden Flood] and Schindel Mais produces 1200 c. green matter per ha. and has 11% sugar in the grain.

Barley. Elsa outyields the previous standard varieties.

Grasses. Productive varieties of *Poa, Bromus, Lolium* and *Phalaris* have been developed, some of them tolerant of boggy soils.

Legumes. The clover Bernburg is noteworthy for its perpetual habit, hardiness and high yields of hay and seed. Among the lupins Harkul and Kraftkul are distinguished by high protein and fat contents. Other lupins are interesting for their high yields, rapid growth and development enabling them to suppress weeds.

Flax. Breeding of dual-purpose varieties is reported. The achievments include Bernburger Ölfaser [Bernburg Oil-Fibre] which produces 47·4 c. straw per ha. and 12·3 c. seed. The straw yields 18·4% fibre and the seed 40% oil.

Jahrbuch 1953 der Bundesanstalt für Pflanzenbau und Samenprüfung in Wien.
(1953 year book of the Federal Institute for Plant Cultivation and Seed Testing, Vienna).
Bodenkultur 1954 : 5. Sonderheft : Pp. 235.

In addition to the information summarized below, the results of variety trials of potatoes and sugar beet are given.

1192 *Nietsch, H. Weitere botanische Beschreibungen von Getreidesorten. (Further botanical descriptions of cereal varieties). (pp. 62–85).*

Tabulated data, illustrated by photographs, are provided on the morphological characteristics of some of the principal varieties of wheat and barley cultivated in Austria (cf. *PBA*, XXV, Abst. 2813).

1193 *Fuchs, H. Der Verarbeitungswert der in Österreich verbreiteten Weizensorten. (The manufacturing quality of wheat varieties widely grown in Austria). (pp. 117–33).*

Technical data, including information on moisture, gluten and crude protein contents, are provided on the grain, dough and flour quality of some of the varieties of winter and spring wheat grown in Austria.

1194 *Zislavsky, W. Frostresistenzprüfung von Winterweizensorten. (Testing for resistance to frost in winter wheat varieties). (pp. 136–56).*

Techniques employed at the Federal Institute for Plant Cultivation and Seed Testing, Vienna, in testing winter wheat varieties for frost resistance are described; they include planting out in the open in boxes and subjecting young plants to shock treatment for 24 hr. in mobile refrigerators. Varietal differences in winter hardiness ascertained by these methods are listed. Positive correlations were observed between growth habit and amount of tillering in plants in the juvenile stage and their degree of frost resistance.

Jahrbuch 1954 der Bundesanstalt für Pflanzenbau und Samenprüfung in Wien. **(1954 year book of the Federal Institute for Plant Cultivation and Seed Testing, Vienna).**
Bodenkultur 1955 : 6. Sonderheft : Pp. 166.

In addition to the information given below, the results of variety trials of cereals and root crops are presented.

1195 *Waltl, K. Tätigkeitsbericht der Chemischen und Qualitätsabteilung.* (*Report on the activity of the Chemical and Quality Division*). *pp. 21–24*).

This report includes information on the baking and milling properties of varieties of wheat imported from North and South America, Australia, Central and Eastern Europe and the Balkans.

1196 *Nietsch, H. Botanische Beschreibung von Gerstensorten.* (*Botanical description of barley varieties*). (*pp. 50–70*).

Tabulated data are provided on the morphological characteristics, maturity groups and resistance to lodging and diseases of 16 malting and fodder barleys grown in Austria. The characteristics of each variety are illustrated by means of a photograph (cf. Abst. 1192).

1197 *Drahorad, F. Phänologische und morphologische Beobachtungen an* Soja hispida *Moench.* [*Phenological and morphological studies on* S. hispida (*Moench*)]. (*pp. 71–91*).

The morphological and physiological characteristics of a wide range of Austrian and introduced varieties of soya bean are listed and recommendations are made as to the varieties most suitable for cultivation under Austrian conditions.

Bericht über die Arbeitstagung 1955 der Arbeitsgemeinschaft der Saatzuchtleiter im Rahmen der Vereinigung österreichischer Saatgutzüchter. **(Report on the 1955 meeting of the working party of the principal seed producers within the framework of the Association of Austrian Seed Producers).** Gumpenstein 1955 : Pp. 342.

The following articles of interest to plant breeders are contained in this report of the above meeting, held on 18–20 January 1955. The opening lectures dealt with the work of different official and private breeding concerns in Austria.

1198 *Wunderlich, G. Ergebnisse bisheriger Untersuchungen über die Auswuchsneigung österreichischer Getreidesorten.* (*Results of studies up to the present on the tendency of Austrian cereal varieties to premature sprouting*). (*pp. 146–73*).

Factors causing sprouting in the ear, the effect of premature sprouting on baking quality and the inheritance of the tendency towards premature sprouting are discussed with reference to the literature, and tabulated data are presented on the tendency of the principal Austrian varieties of wheat, oats, rye and barley towards sprouting in the ear.

1199 *Buchinger, A. Aktuelles aus der Maiszüchtung.* (*Topical facts on maize breeding*). (*pp. 174–95*).

The cultivation of hybrid maize in Austria since the introduction of American hybrids after the war is reviewed briefly; a considerable number of Austrian hybrids have now been developed and tend, under Austrian conditions, to be superior to the American hybrids. After outlining methods of producing hybrid seed and discussing the practical advantages of male sterility, the author lists current breeding aims in Austria; these include the development of early varieties suitable for cultivation in areas where maize cannot be grown at present and improved resistance to frost, drought and diseases. The author also stresses that enthusiasm for the new hybrids must not be allowed to lead to the total displacement of Austrian land races, many of which contain valuable genetical material that should prove useful in future breeding programmes.

1200 *Ulonska, E. Bayerische Gerstenzüchtung in den letzten 10 Jahren.* (*Bavarian barley breeding in the last ten years*). (*pp. 196–237*).

Mention is made of the results of intervarietal crosses carried out at Weihenstephan during the period 1945–55. One of the earliest Weihenstephan hybrids, Isaria, is still widely grown and it is mainly due to the employment of this variety as a parent in further crosses that yield increases of 5–10% and improvements in the grain quality of barley grown in Bavaria have been achieved in the period under review. Donaria and Aurea have also proved useful as parents in breeding for improved quality. Breeding for resistance to lodging, rust and mildew has also received attention and in this connexion the author suggests that new varieties with a moderate degree of resistance to all the main diseases of barley encountered in Bavaria are preferable to varieties highly resistant to one or two diseases but susceptible to others. In winter barleys, breeding for winter hardiness and resistance to *Fusarium* spp. has made good progress and has resulted in the development of such well-known varieties as Dea, Domina and Peragis Melior. In conclusion, tabulated data are presented on the comparative winter hardiness of the principal varieties of winter barleys grown in Bavaria.

1201 *Szilvinyi, A. Internationale Braugerstenkonvention; Ergebnisse der internat. Besprechungen und die sich daraus ergebenden Forderungen an die Pflanzenzüchtung. (International Brewery Convention: results of international discussions and demands upon plant breeding arising from them). (pp. 238–53).*

The work of the Barley Committee of the European Brewery Convention (cf. *PBA*, XXVI, Abst. 3317) in conducting trials of barley varieties for malting purposes in different European countries is discussed and the results of recent trials (cf. *PBA*, XXVI, Abst. 3322) are tabulated. After a brief survey of methods of predicting malting quality from chemical and other characteristics of the grain, the author lists breeding objectives in Austria (cf. *PBA*, XXVI, Abst. 3320).

1202 *Matz, J. Inangriffnahme neuer Zuchtarbeiten im Rahmen der oö. Kartoffelzucht. (Inception of new breeding work in connexion with potato breeding in Upper Austria). (pp. 290–97).*

Breeding for resistance to *Heterodera rostochiensis* and *Rhizoctonia* spp. at the Anzberg Potato Breeding Station, Upper Austria, is reviewed briefly. Two strains of *Solanum andigenum* resistant to *H. rostochiensis* are being crossed with cultivated varieties of *S. tuberosum*. Clones resistant to *Rhizoctonia* spp. have been selected from several cultivated varieties.

1203 *Frimmel, G. Fragen der Resistenzzüchtung (Virus und Phytophthora) unter besonderer Berücksichtigung der Einkreuzung von Wildarten. [Questions in resistance breeding (virus and Phytophthora) with special reference to crossing with wild species]. (pp. 298–311).*

The literature on breeding for resistance to *Ph. infestans*, viruses A, X and Y, leaf-roll virus and aphid vectors by means of crosses between cultivated varieties and *Solanum demissum*, *S. andigenum*, *S. stoloniferum*, *S. acaule* and *S. polyadenium* is reviewed and, in the case of resistance to *Ph. infestans*, difficulties arising from the occurrence of new physiological races are indicated. The employment of the backcross method to eliminate unfavourable characters from the progenies of interspecific crosses, the use of hormones to induce flowering and the induction of polyploidy in wild species to facilitate interspecific hybridization are also discussed. In addition, cultivated varieties possessing resistance to late blight, leaf-roll virus and viruses A, X and Y are listed.

1204 *Steineck, O. Aktuelle Fragen der Kartoffelzüchtung. (Topical questions in potato breeding). (pp. 317–32).*

Seedlings of the variety Flava and seedlings from the cross Sieglinde x Flava were classified according to their reaction to different photoperiods. Plants with a short-day response attained maximum tuber development under a 12-hour photoperiod but, under long-day conditions, produced inferior yields. Such plants may be recognized under long-day conditions by their luxuriant vegetative growth and by the protrusion of their stolons above the soil. Such types can be distinguished in the young plant stage and should be eliminated, as they are useless for cultivation under European conditions (cf. *PBA*, XXV, Abst. 1655). Length of photoperiod was shown to exercise an effect upon the growth of the foliage from the eighth week.

1205 *Schreiber, F. Gemüsezüchtung in Deutschland. (Vegetable breeding in Germany). (pp. 333–42).*

In this lecture, slides were shown illustrating some of the more important varieties of peas, beans, lettuce, cabbage, kohl rabi and radish developed in Germany since 1945 and the comparative merits of the different varieties were discussed.

1206 Estación Experimental de Aula Dei. Departamento de Mejora. Ensayos 1955–1956. **(Aula Dei Experimental Station. Department of Breeding. Tests 1955-56).**
Pp. 24. (Mimeographed).

Wheat. Observations have been made on a number of off-types in some further hybrids and varieties (cf. *PBA*, XXVI, Abst. 994). Some of them have proved superior to the original type in yield and have been selected. In the International Rust Nursery tests 11 varieties have proved resistant to the Spanish races of *Puccinia glumarum*, *P. rubigo-vera* and *P. graminis*.

Soya bean. Varieties with yellow seed have outyielded black-seeded forms, the most promising being some varieties introduced from France, Canada and the USA.

1207 Actividades da Estação Agronómica Nacional. (**Activities of the National Agronomy Station**).
Agros 1955 : **38** : 118–237.

The investigations referred to under the heading cytogenetics include the determination of the chromosome number of those wild species of the Portuguese flora for which it was not already known; detailed caryological studies of certain genera such as *Triticum*, *Luzula* and *Olea*; investigations on the causes of mutation; the induction of polyploidy in a number of plant species and interspecific hybrids; the production of monosomics and nullisomics and their possible use in breeding work in oats, wheat, rice and other cereals; attempts to introduce chromosomes of *Aegilops squarrosa*, *Ae. umbellulata* and species of *Agropyron* and *Haynaldia* into wheat; and the production of maize with high dry-matter content of the stems for use in the production of industrial alcohol. Chromosomal rearrangements in *T. monococcum* after centrifuging, the production of polyploids by treatment with morphine in *Vicia* sp. and wheat and the observation of chromosome duplication resulting from inbreeding in maize are among the results of these studies that are mentioned; others include a fertile tetraploid of *Trifolium resupinatum* with $4n = 32$.

In the pomology section reference is made to cytological studies in a number of vine varieties and hybrids; a list is given of the parental combinations, from which several promising hybrids of both wine and dessert grapes have been obtained; several triploids and a certain number of tetraploid forms have been produced.

In the section on plant breeding mention is made of the following:—

Wheat. S. Giorgio is referred to for its strong straw and Quaderna for its earliness and yielding ability under a wide range of conditions.

A number of wheats have been analysed as to their reaction to rust races 11, 73, 74 and 107.

Rice. Observations have been made on a collection of varieties from different rice-growing areas of the globe and of a number of hybrids. Selections that have displayed clear superiority in respect of yield include numbers 6 and 175; promising seedlings with earlier maturity have been obtained from crosses of the early variety Allorio with Vary Lava 09A. Other hybrids receiving favourable mention are Português [Portuguese] for quality and drought resistance, Lusitano for earliness and EAN7 for general excellence. *Oryza minuta*, *O. glaberrima* and a certain number of cultivated rice varieties, including Vary Lava from Madagascar, have displayed resistance to *Piricularia oryzae*.

Forage plants. Improved lines of a number of species have been selected, among the most successful being *Trigonella foenum-graecum* 12.451, superior in yield to any other form tested, *Trifolium resupinatum* selections that have had marked success in north Africa as well as in Portugal and other Mediterranean countries, and selections of *Lathyrus clymenum*, *L. tingitanus*, *L. articulatus* var. *latifolius* and *L. ochrus*, some of which yield between 40,000 and 70,000 kg. of green matter per ha.

Potato. Resistance to the commonly occurring races of *Phytophthora infestans* has been found in 45 hybrids.

Flax. Some 90 selections and 34 hybrids are under observation for fibre yield and quality, and some 100 selections and 20 hybrids for yield of oil and fibre.

1208 Malato-Beliz, J.
A Estação de Melhoramento de Plantas. Aspectos do passado. Problemas do presente. Perspectivas do futuro. (**The Plant Breeding Station. Aspects of the past. Present problems. Prospects of the future**).
Agros 1955 : **38** : 276–312.

An account of the development of the plant breeding station at Elvas in Portugal since its inception in 1942 and of its present activities is presented. A study has been made of the characters of some 3100 wheats, 1461 barleys, 687 oats and various other species in the cereal collection. Successful varieties produced include the wheats Pirana, Lusitano, Restauração [Restoration], Amarelejo [Yellowish] and Torre [Tower], the oats Santa Maria, S. Francisco, Da Graça and Santa Luzia, all characterized by resistance to *Puccinia coronata*, the newer oat varieties S. Mamede and S. José and the feed barleys De seis ordens [Six-rowed] and a selection from Arivat.

Some of the double-cross maize hybrids produced from local inbreds have exceeded both the local varieties and the best American hybrids in yield.

Improvements in productivity have been effected by selection in *Vicia sativa* var. *obovata* and *Lathyrus cicera*, in addition to which a number of other species have been studied as to their suitability for forage production in Portugal.

Chromosome duplication has been induced in *Trigonella foenum-graecum*, *Secale cereale*, *Lathyrus cicera, Hordeum vulgare* and a series of *Triticale* hybrids.

Tests of over 60 wheat varieties with races 14, 16, 21, 40 and 186 of *Puccinia graminis* var. *tritici* have been made and investigations are being carried out on the races of this and other rust species occurring in Portugal.

1209 MEKSIN, D. V.
(Breeders).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 10 : 18–20. [Russian].

This account of breeding work on cereals, leguminous crops and grasses at Sineljnikovo mentions new productive lodging-resistant winter wheats, trials of American, Canadian and Soviet maize inbreds, new high-yielding winter vetches, and a sainfoin variety obtained by interspecific hybridization. *Triticum-Secale* hybrids, notable for long ears and resistance to rust are also mentioned.

1210 Årsberättelse över Sveriges Utsädesförenings verksamhet år 1955. **(Annual report on the work of the Swedish Seed Association in the year 1955).** Sverig. Utsädesfören. Tidskr. 1956 : **66** : 71–157.

In addition to the details of breeding work summarized below information is provided on the results of trials of new and old varieties and breeding lines of numerous crop plants at Svalöf and its branch stations. Breeding of linseed, hemp, hops, poppy and lupin continued and is briefly reported.

The following Svalöf varieties have received the designation "Original": the autumn rye Värne; the spring wheat Proctor, later renamed Safir [Sapphire]; the red clover Hermes; the spring turnip rape Arlo; the *Bromus inermis* variety Frigga; and the autumn wheat Diana.

Wheat. A wheat x rye hybrid, Triticale O, has given good yields. Experiments on grafting embryos from spring wheat x rye crosses on to endosperms of other species are in progress, together with serological investigations, with the aim of elucidating causes of interspecific differences between rye and wheat.

Rye. Clones of Kungsråg II [King's rye II] and Värne have been set up for the production of élite material and of top crosses. Lines from spring x autumn rye crosses and from Petkus x a land race from Öd show promise. Tetraploid material obtained by colchicine treatment of numerous varieties is undergoing selection. It has proved possible to select for regular meiosis and greater fertility in tetraploid rye. The effects of the accessory chromosomes found in some varieties have been studied.

Barley. Progress has been made in constructing a gene map on the basis of observations on X-ray induced and other mutants, especially of the *erectoides* type. Chromosome doubling has been effected in a number of mutants and their genetical behaviour is being compared with that of the corresponding diploids. The X-ray induced mutant Erectoides 32 has shown promise both in yield and in straw strength.

Grasses. Work on the production of amphidiploids within and between *Festuca* and *Lolium* is in progress. Accessory chromosomes in meadow fescue are being studied.

Lucerne. Many crosses have been effected among colchicine-treated lines with the aim of producing "triploid" material.

Clover. Many Swedish red and white clover lines have received colchicine treatment. In addition, central and southern European varieties are being subjected to chromosome doubling with the ultimate aim of developing interspecific hybrids.

Serradella. A tetraploid population has been obtained by colchicine treatment.

Root crops. Eight different swede types have been obtained from crosses between cabbage and turnip and comparative trials of synthetic and ordinary swede have been established. Colchicine-induced autotetraploid turnips generally have lower dry-matter contents than diploids and are being crossed with the tetraploid Forus Majnepe [Forus May turnip] which has a high dry-matter content.

In work on sugar beets, mangels and sugar mangels, attempts are being made to utilize male sterility in the production of triploids. Monogerm material has undergone chromosome doubling. Since triploids are vigorous and more productive than tetraploids, investigations are being carried out to determine the ratio of diploid and tetraploid parents giving the highest frequency of triploids in the progeny in mixed plantings.

Potato. The production of breeding material free from viruses X and S through the use of antisera was begun. Trials of γ-irradiated material and tests for resistance to *Phytophthora* and nematodes are in progress.

Flax. Investigations on X and neutron irradiation have been initiated on a large scale, the chief varieties studied being Kristina and Wiera.

Rape. Promising material has been obtained from the crosses autumn x spring rape and autumn x spring turnip rape and from X-irradiated spring rape. Numerous cabbage

varieties have been used in the synthesis of rape, including a wild cabbage from Heligoland in which chromosome doubling has been induced.
Kok saghyz. About 700 plants have been selected for further crossing and seed production.
Other investigations. A technique for inducing chromosome doubling in peas and vetches by means of nitrous oxide is being studied and methods of producing haploid plants are under investigation. Treatment of plants with ethoxycaffeine appears to result in chromosome aberrations only, with little or no apparent gene mutation, while the reverse is true of nebularin.

1211 VESTERGAARD, E.
Abed Planteavlsstation. (**Abed Plant Breeding Station**).
Planteavl. Loll.-Falster. 1954 (1955) : 3–11; 1955 (1956) : 3–16.

Wheat. Details of varietal trials held at various stations in Denmark during 1950–53 are presented. Abed 8–53 (Abed 32 x Jubilé) has continued to do well (cf. *PBA*, XXIV, Abst. 2749).
Oats. Results of state trials held on various soil types throughout Denmark during 1949–54 are reported. Abed 636 (Minor x Abed 30), which has given consistently high yields, has been named Max and is expected to be released in the autumn of 1956. It has been used as a parent in crosses with the Netherlands variety Marne.
Barley. Abed 978 (Balder x Weihenstephan II) is mildew resistant and has given good though not outstanding yields over several years. Many high-yielding lines resistant to both lodging and mildew have been obtained from Denso x Weihenstephan II; they have also shown some drought resistance. Abed 2–45 S, a selection from Strengs Franken III, is another promising stiff-strawed variety.
Sugar beet. The results of state variety trials on clay soils and sandy soils during 1952–54 are reported.

1212 DE HAAN, H.
Justification des frais des recherches sur l'amélioration et sur les variétés de plantes de grande culture. (**Justification of the cost of research on breeding and on varieties of crop plants**).
Netherlands J. agric. Sci. 1956 : **4** : 299–304.

The work of the University of Agriculture, Wageningen, Netherlands, in carrying out research on crop plants, breeding new varieties and advising farmers on the best varieties to grow is reviewed briefly. Present work is concentrated on breeding for resistance to *Phytophthora infestans* in potatoes and for resistance to various diseases in flax and the bitter lupin. It is concluded that expenditure on research in the Netherlands is fully justified by the increased yields obtained from improved varieties of crop plants.

1213 SALZMANN, R.
Tätigkeitsbericht der Eidg. Landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon über das Jahr 1955. (**Report on the work of the Federal Agricultural Research Station, Zürich-Oerlikon, for the year 1955**).
Landw. Jb. Schweiz 1956 : **5** : 285–353.

The results of variety trials of wheat, oats, barley, rye and maize are presented, together with brief details of breeding work on cereals and leguminous forage plants. In wheat breeding, priority is being given to improving resistance to dwarf bunt, yellow rust, brown rust and leaf scorch.

1214 (**Mičurinist theories over the border**).
Priroda (Nature), Leningrad 1956 : No. 10 : 63–68. [Russian].

ROMANOVIČ, A.
(**In the Rumanian People's Republic**).
Ibid. 1956 : No. 10 : 63–65.

REĬMAN, A.
(**In democratic Poland**).
Ibid. 1956 : No. 10 : 65–67.

ŠOMOŠ [SOMOS], A.
(**In the Hungarian People's Republic**).
Ibid. 1956 : No. 10 : 67–68.

Breeding work in these countries with cereals, beets, vegetables, fruit trees and vines, together with the Mičurinist methods employed, is discussed. Among the achievements are the high-yielding maize hybrid Mv5, the sugar beet variety K91 and the mangel Beta Rozovaja [Rosa Beta] from Hungary, and hybrids of tomato x *Capsicum* and potato x tomato from Rumania.

Annual Report of the National Institute of Genetics, Japan 1953 (1954) : No. 4 : Pp. 69.

1215 *Matsumura, S. Tetrasomic gigas-plants in the offspring of nullisomic dwarfs and analysis of their additional chromosome pair.* (*pp. 29–30*).
Cf. *PBA*, XXVI, Abst. 2180.

1216 *Matsumura, S. Chromosome aberrations in Einkorn wheat induced by X-rays. (pp. 30–31).*

The relation between wave length and frequency of induced chromosome aberrations reported earlier (cf. *PBA*, XXVII, Absts. 196 and 225) was not confirmed when the thickness of the filter was adjusted in inverse proportion to the wave length.

1217 *Eto, H., Matsumura, S. & Fujii, T. Measurement of X-ray dosage for inducing mutations. (p. 31).*

The distribution of X-ray dose at a distance of 15 cm. from a Matsuda Type KXC–17 apparatus, tube Type STO–200–3, was examined. Dosage was larger on the cathode side than on the anode side. It is recommended that material for exposure be placed on a rotating table close to the tube focus.

1218 *Gotoh* [*Goto*], *K. Inter-racial differences found in the variety of barley "Hosogara No. 2". (pp. 31–32).*

Cf. *PBA*, XXVI, Absts. 2327–8 and XXVII, Abst. 1790.

1219 *Lilienfeld, F. A. Cytogenetical problems in* Nicotiana. *(pp. 32–33).*

The F_1 of *N. paniculata* x *N. plumbaginifolia* has usually $0–2_{II} + 18–22_{I}$. In the amphidiploid, meiosis is quite regular.

The F_1 of Dixie Bright x (*N. sylvestris* x *N. tomentosiformis*) showed pronounced heterosis but its female fertility was rather low. The octoploid derivative of the amphidiploid was markedly deformed. (Cf. Abst. 228).

1220 *Takenaka, Y. Cytogenetic studies on the genus* Nicotiana. *V. (pp. 33–36).*

Meiosis in various interspecific hybrids of *Nicotiana* is described. In *N. tabacum* x *N. trigonophylla*, the modal bivalent number was $5–6_{II}$; in *N. undulata* x *N. tabacum*, it was $3–5_{II}$. The F_1 of *N. tabacum* x *N. rustica* showed 1–10 bivalents or multivalents at metaphase I and secondary association was frequent. Modal bivalent frequencies in F_1 hybrids involving the *N. tomentosa* group were as follows: *N. glauca* x *N. otophora*, $4–5_{II}$, and *N. sylvestris* x *N. tomentosiformis*, 4_{II}. Heteropycnotic bodies were noted at prophase in the first cross. In *N. paniculata* x *N. otophora*, $3–10_{II}$ were observed. Hybrids were obtained from *N. sanderae* crossed with (1) *N. longiflora*, (2) *N. plumbaginifolia* and (3) *N. suaveolens*. In (1), the modal chromosome arrangement was $9_{II} + 1_{I}$; the chromosome behaviour of (2) was similar to that in (1); while in (3) the modal bivalent number was $3–4_{II}$. (Cf. Abst. 230).

1221 *Sakai, K.-I. & Iyama, S. Genetical studies on the mid-rib proportion and the leaf-shape in tobacco plants. (pp. 36–38).*

Cf. *PBA*, XXV, Abst. 3295.

1222 *Matsumura, S. & Fujii, T. Mutations in tobacco induced by X-rays. (pp. 38–39).*

Cf. *PBA*, XXVI, Abst. 1567.

1223 *Takenaka, Y. Sex relations in artificially produced tetraploids of* Melandrium album. *(pp. 39–41).*

Studies on the sex ratios of the progenies of 4*n* *M. album* are reported. A large excess of males resulted from the combination 4*n* ♀ x 4*n* ♂; this is attributed to the preponderance of XY pollen grains.

1224 *Takenaka, Y. Ring formation in the meiosis of* Allium scorodoprasum *var.* viviparum. *(pp. 41–42).*

At metaphase I, a ring of 6 chromosomes and 5_{II} are usually formed. Reproduction is mainly viviparous. It is inferred that this form resulted from interspecific crossing.

1225 *Tateoka, T. Karyotaxonomic studies in Poaceae I. (pp. 45–47).*

Chromosome numbers of Japanese representatives of the following genera are reported: *Pleioblastus*, *Sasa*, *Hordeum*, *Brachypodium*, *Elymus*, *Bromus*, *Calamagrostis*, *Agrostis*, *Phleum*, *Alopecurus*, *Beckmannia*, *Helictotrichon*, *Trisetum*, *Koeleria*, *Deschampsia*, *Milium*, *Anthoxanthum*, *Hierochloe*, *Phalaris*, *Leersia*, *Dactylis*, *Festuca*, *Poa*, *Briza*, *Melica*, *Glyceria*, *Torreyochloa*, *Moliniopsis*, *Hakonechloa*, *Phragmites*, *Eragrostis*, *Cynodon*, *Arundinella*, *Echinochloa*, *Panicum*, *Setaria*, *Isachne*, *Imperata*, *Miscanthus*, *Microstegium*, *Arthraxon*, *Bothriochloa*, *Ischaemum* and *Coix* (cf. *PBA*, XXVI, Abst. 1338).

1226 *Iino, T. Studies on the methionine-requiring strain of* Ustilago maydis. *(pp. 47–49).*

In the first section of this article, a case of two-step recovery to methionine independence by the methionine-requiring strain 4–24 is described. Recovery is via two mutations, the first showing restricted growth and the second normal growth without methionine. (Cf. *PBA*, XXIV, Abst. 119).

1227 *Matsumura, S. Improvement of sugar beets by means of induced triploidy. (pp. 54–55).*

For the results of the work carried out on the above subject during 1940–52, readers are referred to the book summarized in *PBA*, XXVI, Absts. 3569–79. In 1953, unfavourable weather is believed to have been responsible for some discrepant field-trial results. The triploid hybrid $3n$–1 did no better than the diploid progenitor. Two new promising triploids were discovered.

1228 *Gotoh [Goto], K. Further investigations regarding the degree of heritability and the number of effective factors in the eggplant. (pp. 55–56).*
Cf. *PBA*, XXV, Abst. 3518.

1229 *Furusato, K. Studies on polyembryony in citrus. (p. 56).*
It has been shown that nucellar polyembryony depends on prior pollination. Figures are given for number of embryos in the Unshu (= Satsuma) mandarin with different pollinators. Embryo number can be reduced by injecting the fruits with water or growth hormones. (Cf. Abst. 212).

1230 *Sakai, K.-I. & Gotoh [Goto], K. Competitive ability of F_1 hybrids in barley. (p. 57).*
Cf. *PBA*, XXVI, Abst. 412.

1231 *Sakai, K.-I. & Suzuki, Y. Further studies on competition between diploid and autotetraploid plants of barley. (pp. 57–58).*
Cf. *PBA*, XXV, Abst. 1983.

1232 *Sakai, K.-I. & Suzuki, Y. Competition studies on diploid and autotetraploid plants of rice. (p. 58).*
The relative competitive ability of $2n$ and $4n$ strains of four varieties was investigated. The characteristics studied were dry weight, culm number, weight and number of panicles and grain weight. Intergenotypic differences in competitive ability were highly significant. In general, autotetraploids competed less well than the corresponding diploids.

1233 *Sakai, K.-I., Iyama, S. & Meguro, T. Competitive ability of thirty varieties of upland rice against the so-called "red rice". (pp. 58–59).*
Mixed sowing of upland rice varieties with red rice showed that most upland varieties are at a competitive disadvantage compared with red rice. A few upland varieties however are of equal or stronger competitive ability compared with red rice.

1234 *Sakai, K.-I. & Suzuki, Y. Competition and spacing in one dimension in plants. (pp. 59–60).*
The effects of spacing distance on single-row mixed plantings of two barley varieties differing in competitive ability were studied. As spacing distance decreased, the yield component due to competition increased, the increment being inversely proportional to $\log_{10}(\log_2 x_i)$, x_i representing the distance between adjacent plants.

1235 *Sakai, K.-I. 1. Theoretical studies in the breeding technique of autogamous crop plants. a. Change in the value of heritability of quantitative characters in hybrid bulks and plant progenies in autogamous plants. (pp. 60–63).*
Cf. *PBA*, XXV, Abst. 2642.

1236 *Sakai, K.-I. 1. Theoretical studies in the breeding technique of autogamous crop plants. b. Heritability and the number of individuals to be selected. (pp. 63–65).*
Formulae are derived for the number of lines to be selected in a segregating population when selecting for a character having any particular heritability value. A table of minimum numbers of selections for various heritability values and intensities of selection is given.

1237 *Takenaka, Y. A new chemical "substance F" for inducing doubling of chromosomes. (pp. 65–66).*
The above alkaloid, recently extracted from *Colchicum* corms, has a c-mitotic effect. Its possible use as an agent for inducing polyploidy is being investigated.

Annual Report of the National Institute of Genetics, Japan 1954 (1955) : No. 5 : Pp. 90.

1238 *Oka, H.-I. Analysis of genes for hybrid sterility in the varieties of cultivated rice. (pp. 40–42).*
Cf. *PBA*, XXVI, Abst. 2411.

1239 *Oka, H.-I. Variation in fertility due to gametic-development genes. (pp. 42–43).*
A preliminary mathematical study of the variation in fertility to be expected if a number of gamete-development genes are present was made. Analysis of experimental data with rice to test the conclusions is reported in Abst. 581.

1240 *Oka, H.-I. Change of segregation ratio due to gametic development genes. (pp. 44–45).*
Formulae are derived for the disturbance in F_2 segregation ratios which would result from linkage between a locus and a gamete-development gene. An example concerning apiculus coloration in rice is given. The glutinous gene is also affected.

1241 *Oka, H.-I. Change of gene frequency in hybrid populations of rice. (pp. 45–47).*
Cf. *PBA*, XXVI, Abst. 3364.

1242 *Oka, H.-I. Restriction of gene recombination in hybrid populations of rice. (pp. 47–48).*

It is shown that if two independent loci are each linked with gamete-development genes of the same set, the segregation ratios of the two loci will mimic those of linked loci owing to the elimination of cells carrying gamete-development genes in the double recessive condition. An example of such spurious linkage between the apiculus-coloration (*C c*) and phenol-reaction (*Ph ph*) loci in rice is given.

1243 *Oka, H.-I. Do chromosomes in tetraploid hybrids between distantly related varieties of cultivated rice tend to pair selectively? (pp. 48–50).*

Cf. *PBA*, XXVI, Abst. 2402.

1244 *Gotoh [Goto], K. Genetic analysis of differentiation of local strains in the barley "Hosogara No. 2". (pp. 50–52).*

Cf. *PBA*, XXVI, Absts. 2327–8 and XXVII, Abst. 1290.

1245 *Sakai, K.-I. Effect of the number of competing and non-competing individuals on competitional increment. (pp. 53–54).*

The effect of number of competing individuals was analysed by surrounding a central plant (barley or rice) by six other plants of the same species. The six surrounding plants comprised all possible combinations (6–0 to 0–6) of the same variety and another variety differing in competitive ability. It was shown that the effect of number of competitors followed a rectilinear regression line.

1246 *Sakai, K.-I. & Oka, H.-I. Polygenic analysis of quantitative characters under influence of intergenotypic competition. (pp. 54–56).*

Mather's technique of partitioning variance into *D*, *H*, and *E* components is extended to cover variance due to intergenotypic competition. This last variance can be partitioned into four components: *C'*, variance due to increments resulting from competition between dominant and recessive homozygotes for genes affecting competition (*c*); *G'*, the corresponding variance for heterozygotes and homozygotes (*g*); *M'*, covariance between *c* and *d*; and *N'*, covariance between *g* and *h*. Using these components, analogous formulae to those derived by Mather for F_2 and backcross data are worked out. Examples are given, based on the inheritance of panicle number in two rice crosses, to illustrate that the new formulae provide better estimates of heritability than the old.

1247 *Sakai, K.-I. & Oka, H.-I. How does a mixed population of autogamous plants change in response to intra-population competition? (pp. 56–58).*

Formulae are derived for the frequency of the components of a mixed sowing of two varieties differing in relative rate of propagation and competitive ability. Analysis of mixed sowings of the rice varieties Taichung 65 and O-chiam in Taiwan showed that these two characteristics varied with temperature.

1248 *Sakai, K.-I. & Suzuki, Y. Competition experiment with diploid and autotetraploid races of rice. (pp. 58–59).*

The results of this experiment coincide with those reported in the previous year (cf. Abst. 1232).

1249 *Sakai, K.-I. & Suzuki, Y. Competition experiment with two Nicotiana species and their allotetraploid. (pp. 59–60).*

The amphidiploid of *N. alata* x *N. plumbaginifolia* competes as well as or slightly better than *N. plumbaginifolia*, the more strongly-competing parent, in mixed sowings.

1250 *Matsumura, S. & Fujii, T. Gene mutations in Einkorn wheat induced by X-rays. (pp. 60–61).*

Cf. *PBA*, XXVI, Abst. 2197.

1251 *Fujii, T. Chlorina mutants in Einkorn wheat induced by X-irradiation. (pp. 61–62).*

Cf. *PBA*, XXVI, Abst. 3177.

1252 *Takenaka, Y. Cytogenetic studies on the genus Nicotiana, VI. (pp. 62–66).*

In the present paper of this series (cf. Abst. 1220) the following metaphase configurations are reported: *N. tabacum* x *N. alata*, mode at $3\text{–}4_{II} + 17\text{–}15_{I}$; *N. tabacum* x *N. tomentosiformis*, mode at $12_{II} + 12_{I}$; *N. sylvestris* x *N. otophora* usually $2\text{–}3_{II}$ with secondary association between univalents; *N. alata* x *N. sanderae*, 9_{II} and occasionally $8_{II} + 2_{I}$; *N. rustica* x *N. paniculata*, mode at $3_{III} + 9_{II} + 9_{I}$; and *N. langsdorffii*, mode at $1_{IV} + 7_{II}$.

1253 *Matsumura, S. & Fujii, T. Mutation in tobacco plants induced by X-rays. (p. 66).*

Cf. *PBA*, XXVI, Abst. 1567.

1254 *Furusato, K. & Miyazawa, A. Hybridization experiments with* Citrullus vulgaris *and* Citrullus colocynthis. *(p. 67).*

Diploid and triploid hybrids have been obtained from crosses between *C. colocynthis* ♀ and $2n$ and $4n$ *C. vulgaris* ♂, respectively. The fruits of the triploid hybrids were seedless but bitter.

The striped exocarp and texture of the endocarp of *C. colocynthis* were dominant.

1255 *Tateoka, T. Karyotaxonomic studies in Poaceae, II.* (*pp. 68–69*).

Chromosome counts of representatives of the following genera are reported: *Bromus, Agropyron, Elymus, Lolium, Brachypodium, Festuca, Poa, Glyceria, Torreyochloa, Agrostis, Calamagrostis, Polypogon, Alopecurus, Arrhenatherum, Trisetum, Brachyelytrum, Stipa, Achnatherum, Phaenosperma, Pleioblastus, Pseudosasa, Sinoarundinaria, Sinobambusa, Sasamorpha, Semiarundinaria, Arundinaria, Sasa, Cleistogenes, Eragrostis, Eleusine, Sporobolus, Muehlenbergia, Zoysia, Cenchrus, Setaria, Digitaria, Oplismenus, Paspalum, Pennisetum, Cymbopogon, Eccoilopus, Microstegium, Hemarthria, Andropogon, Pseudopogonatherum, Sorghum* and *Phacelurus* (cf. Abst. 1225).

1256 *Takenaka, Y. Effects of extracts from poisonous plants upon living plant tissue.* (*pp. 69–71*).

C-mitotic effects have been induced in root tips of *Allium scorodoprasum* var. *viviparum* by extracts from *Gloriosa superba* and *Zephyranthes candida.*

1257 *Endô, T. Analysis of flavone pigments in* Triticum *and related plants under consideration of their genome constitution.* (p. 72).

A comparative paper-chromatographic analysis has been made of the flavones of species of *Triticum, Aegilops, Agropyron, Secale, Haynaldia* and *Hordeum.* The affinities of the chromatograms corresponded closely with the putative genomic relationships of the species.

1258 *Iino, T. The delayed appearance of the O-antigen transformation in* Salmonella. (*pp. 75–76*).

When cells of *S. anatum* are transduced by the filtrable agent of *S. newington*, O-antigen transformation is liable to occur later than transduction.

1259 *Iino, T. The paths of the reversion in the methionine-requiring strain of* Ustilago maydis. (*pp. 77–78*).

Further to the work reported in *PBA*, XXIV, Abst. 119 and XXVII, Abst. 1226, the author estimates the relative reversion rates of the methionine-requiring strain 4–25* to methionine independence by one-step or two-step mutation.

1260 *Tsujita, M., Matsui, C., Tsuda, S. & Yoshizawa, O. Studies on the lysogenicity of* Pseudomonas solanacearum. (*pp. 80–82*).

Among the results reported are irreversible loss of lysogenicity in strain T–c200 by ultraviolet light and the formation of a double lysogenic strain by superinfecting S–9 with T–c200 temperate phage. The double lysogenic strain produces the two original phages and a new, presumably recombinant, phage.

1261 *Sakai, K.-I. Some considerations on the problem of secondary selection in self-fertilized crop plants.* (*pp. 84–85*).

Cf. *PBA*, XXVI, Abst. 2397.

1262 *Sakai, K.-I. Theoretical basis for discriminating the most desirable hybrid combinations in early generations.* (*pp. 86–87*).

Cf. *PBA*, XXVI, Abst. 1971.

1263 **Report of the Bose Institute, Calcutta for 1953-54** : Pp. 100.

Report of the Bose Institute, Calcutta for 1954-55 : Pp. 124.

Chemical mutagenesis. According to the report for 1953–54, investigations on the mutagenic effects of widely different chemicals, such as hydrocarbons, azo-compounds, esters of carbamic acid, higher phenols and organic and inorganic salts, have been initiated in various plants, e.g. *Lens, Vicia, Pisum, Allium* and *Linum.*

Cotton. The scheme of developing long-stapled varieties for the delta areas continued, information being given on the performance of many F_4–F_{10} hybrids, some of which combined satisfactory yield, lint length and ginning percentage. In some types, irradiated seeds gave rise to X_1 plants showing marked increases in boll number; the behaviour of the progenies of these higher-yielding individuals remains to be investigated. KI (*Gossypium arboreum* var. *typicum*) and 7036, C–II–2, 7067 and 7070, all representatives of *G. arboreum* var. *indicum*, have been subjected to a caryotype analysis which has provided the basis of suggestions concerning their phylogenetic relationships.

Jute. R26 (*Corchorus olitorius*) has proved to be more sensitive to X irradiation than other varieties of cultivated jute. A new variety, Tall Mutant, obtained by irradiating seeds of R26, has been stabilized. Characterized by deep-scarlet leaves and stems when mature, the mutant gave about 40% higher average yield of fibre than R26 in two seasons under review. The increase in yield is due to a greater number of fibre bundles. Tall early-flowering selections showing promise have been isolated from Tall Mutant. Some progenies derived from R26 treated with β rays from P^{32} have segregated for the Tall Mutant, Chinsura Green and R26 types. Investigations are to be continued in order to determine the number of genes involved in the mutation of R26 to the other two types.

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* Designated 4–24 in the previous papers.

Oil crops. Selections outyielding the parental controls have been obtained from progenies derived from X-irradiated seed of *Brassica campestris* and *B. juncea.* As shown by Rai 5, this superiority may be maintained in the X_3, but it is considered premature to regard the higher-yielding forms as stabilized.

The capacity of X-ray-induced mutants of sesame to give higher yields than the parent types was maintained, the most advanced material studied consisting of the X_5. The earliness and greater uniformity in flowering period shown by some mutants were also maintained. Even with a dose as high as 100,000 r., seed germination has been satisfactory and the production of abnormalities inconsiderable. In investigations during 1954–55, an X_5 mutant of Bengal type 16 had an oil content of 53·53% as against 41·24% in the control.

Cucurbits. Chromosome morphology, the number of nucleoli and their relationship with secondary constrictions are being investigated in *Cucumis sativus*, *Cucurbita maxima* and *Citrullus vulgaris*, to discover whether heteromorphic chromosomes are associated with sex differentiation. In *C. sativus* one pair appears to be heteromorphic.

Tomato. Cytogenetical studies of *Lycopersicon esculentum* and other species have been initiated.

Egg plant. In the cross Green Long x T17, pink fruits were dominant over white and compound inflorescences over simple. Caryotypical studies of *Solanum melongena* and other species are reported. Egg-plant varieties show differences in the number of satellited chromosomes. Investigations have been undertaken to elucidate the problem of the basic number of the genus. Regular bivalent formation ($n = 12$) was observed, except in *S. macranthum* in which laggards and other irregularities resulted in inability to set fruits.

Proceedings of the forty-second Indian Science Congress, Baroda, 1955 : Pp. 85 + 279 + 431 + 150 + 155.
Part III Abstracts

1264 *Maheshwari, P., Sachar, R. C. & Chopra, R. N. Embryological studies in mango* (Mangifera indica *L*). (*p. 233*).

Four of the fifteen varieties studied showed polyembryony: three Philippine varieties, Paho with 1–9 embryos, Higgins with 3–12 embryos, and Cambodia with 2–7 embryos, and one Indian variety, Olour with 6–14 embryos. A larger number may be formed but not all of them reach maturity. In the case of Olour and Cambodia no embryo is formed from the zygote, all the adventive embryos develop from nucellar cells at the micropylar end of the ovule, and some fusion may occur between them. The other eleven varieties are monoembryonic and in five of them the embryo is known to be of zygotic origin.

1265 *Datta, R. M. & Patel, G. I. Cytogenetical investigations of X-ray induced mutations in jute* (Corchorus olitorius *Linn.*). (*pp. 244–45*).

Seeds of 040–632 were treated with eight different doses of X rays. From late diakinesis onwards various chromosome abnormalities were observed. At diakinesis seven bivalents and one or two fragments, five bivalents with one quadrivalent and up to three fragments, or three bivalents with two quadrivalents and up to three fragments were seen. At metaphase I one or two chromosome pairs were found lying on the spindle away from the metaphase plate. These chromosomes were unable to separate but moved together to one pole. At anaphase I various bridge and fragment associations were observed, and by the end of telophase I these bridges were broken, most of them near the centre. Two small dot-shaped fragments of similar size were commonly seen in the cytoplasm, lying near each other and sometimes enclosed by a membrane.

1266 *Bhat. N. R. & Desai, N. D. Genetic investigations of the 'whorled' mutant in* Gossypium herbaceum. (*p. 245*).

Crosses were made between the whorled mutant and three other strains of *Gossypium herbaceum*; (1) 8–1 red, (2) ghost spot, white flower, 4–5 loculed triple recessive and (3) cluster - short branch, ghost spot, white flower, 4–5 loculed quintuple recessive. The F_1 plants were normal in respect of branching habit and had 2–3 or 3–4 loculi in their ovaries. The segregations in the crosses with both the triple and quintuple recessives were disturbed as a result of a 33% deficiency in viability of the ghost spot segregates. In the cross with 8–1 red a recombination value of 11·6% was found between the R_2 and whorled (c_1c_2Wh) loci. A recombination value of 29% was found between R_2 and cluster-short branch (cl_2BH) in the cross with the quintuple recessive. Loci cl_2Wh and cl_2BH were found, by a three point test, to be situated on either side of R_2 and the observed recombination value between them was near the expected value of 36·5%; cl_2Wh is fully linked, or identical, with loc^{2-3}, the locus for 2–3 loculi in the ovary; loc^{4-5}, which is complementary to loc^{2-3}, is closely linked with it but recombination values could not be estimated because of the poor viability of the ghost-spot segregates.

1267 *Thiagarajan, T. R. Differentiation and dedifferentiation in yeasts. (p. 246).*

It is suggested that yeast cells which have become endopolyploid, during growth as a giant colony, become dedifferentiated after transfer to fresh media by a process of cell division in the absence of chromosome reproduction.

1268 *Roy, R. P. An additional evidence for the presence of the genome of* Aegilops squarrosa *in the hexaploid wheats. (pp. 246–47).*

Several crosses were made between intergeneric amphidiploids of *Triticum* spp. x *Aegilops* spp. and some hexaploid wheat species, most of which produced normal viable progeny. Non-viable progeny were produced by the two crosses (*T. dicoccoides* x *Ae. bicornis*) x *T. aestivum* and (*T. dicoccoides* x *Ae. bicornis*) x *T. spelta*. The results of further crosses between (*T. dicoccoides* x *Ae. bicornis*) and other intergeneric amphidiploids of *Triticum* and *Aegilops* suggest that the cause of the inviability is associated with the genome of *Ae. bicornis* and the DD genome of the hexaploid wheats, and not with the AA BB genomes of *T. dicoccoides* and the bread wheats. It is concluded that the DD genome of the hexaploid wheats is derived from *Ae. squarrosa*, since inviability occurs in hybrids of (*T. dicoccoides* x *Ae. bicornis*) with either hexaploid wheats or other amphidiploids containing the genome of *A. squarrosa*, but not with amphidiploids containing the genomes of other *Aegilops* species.

1269 *Sen, N. K. & Ghosh, A. K. Study on karyotype of common pulses. (pp. 247–48).*

On the basis of chromosome size the pulses examined may be divided into two groups: (1) those with small chromosomes, including *Cicer arietinum* ($2n = 16$), *Phaseolus radiatus* (22), *Ph. mungo* (22), *Cajanus cajan* (22), *Vigna sinensis* (24) and *Glycine soja* (40) and (2) those with large chromosomes, including *Lens esculenta* and *Pisum sativum*, both with $2n = 14$. In all cases the chromosomes have a submedian constriction and at least two pairs have prominent secondary constrictions. The pulses in group (1) have at least one pair of very small chromosomes, there being three such pairs in *Glycine soja*. Those in group (2) have a pair of chromosomes with a secondary constriction close to the primary constriction, and another pair with several secondary constrictions.

1270 *Bhardwaj, S. N. Effect of long and short photoperiods on incidence of flowering in wheat and gram. (pp. 256–57).*

Photoperiods of 16 hours and eight hours were given to two varieties of wheat, NP165 and Cwn13, and two varieties of *Cicer arietinum*, NP28 and NP58, for two weeks, commencing four weeks after emergence. The short photoperiod retarded ear emergence by about seven days in both wheat varieties, no varietal difference in response being observed. In the case of variety NP28 of *C. arietinum* no effect was found with the short photoperiod but the long photoperiod delayed flowering by an average of 5·8 days. In the case of NP58, plants receiving the short photoperiod flowered 10·5 days earlier and those receiving the long photoperiod 10·0 days later than the controls.

1271 *Sen, B. & Verma, D. K. Estimation of amino-acids in the vernalisable and non-vernalisable strains of wheat. (p. 263).*

Aminoacids were identified by paper chromatography in extracts from seeds of three wheat varieties, Frondoso and Jaya which cannot be vernalized, and Atlas-50 which is vernalizable. Frondoso had the highest aminoacid content and Jaya the lowest, except for spots 6 and 8; l-cysteine was not found in Jaya.

1272 *Sen, B. & Joshi, H. C. Permeability of the plasma membrane of leaf cells of rust resistant and susceptible varieties of wheat. (pp. 263–64).*

Results of a series of experiments have shown that (1) the resistance of wheat leaves to an electric current was greater in the rust-susceptible variety tested than the rust-resistant variety tested, (2) the percentage diminution of resistance due to electric shock was greater in the susceptible variety and (3) the resistant variety showed a greater and more rapid percentage recovery from stimulus. On the assumption that the resistance of plant cells to an electric current can be correlated with the permeability of their plasma membranes to ions, it is concluded that (1) there is a greater number of free ions in the leaf cells of the rust-resistant variety and (2) given a stimulus of similar strength the increase of permeability produced in the rust-susceptible variety is greater than that produced in the resistant variety.

1273 *Misra, G. Effect of long daylength on three medium-early varieties of rice.* (*p. 265*).

Twenty-four hour photoperiods were given to three medium-early varieties of rice, T3, T12 and T21, for three to six weeks. Delay in ear emergence was found in all cases, the amount increasing with increasing length of treatment. The average delay, with four-week treatments, is 4·05 days for T3, 5·90 days for T12 and 2·05 days for T21.

1274 *Misra, G. Effect of long-day photoperiod on four early winter varieties of rice.* (*p. 265*).

Four early varieties of rice, T1145, T36, T23 and T17, were subjected to 24-hour photoperiods from the age of one week for three to six weeks and were then grown on under normal conditions. T23 showed pronounced delay in ear emergence but in the other varieties the delay was not significant.

1275 *Misra, G. Effect of long photoperiod on four late-winter varieties of rice.* (*p. 265*).

No varietal difference was observed between the responses of C3, SR26B, FR13A and FR43B to 24-hour photoperiods for three to six weeks.

Part IV. Discussions.

1276 *XXI. Plant breeding methods in relation to physiological and biochemical characters.* (*pp. 102–07*).

N. Parthasarathy discussed some of the problems and aims of modern plant breeding and R. D. Asana described preliminary physiological investigations of drought resistance in relation to yield in wheat, which have been carried out to assist the breeding of drought-resistant varieties. Some biochemical aspects of plant breeding were discussed by G. S. Murty with reference to wheat, and by J. T. Rao and R. R. Panje with reference to sugar cane. S. M. Sircar said that slow progress in rice breeding was due in large measure to lack of proper consideration of the physiology of the plant, especially in relation to environmental factors of all kinds; G. V. Chalam described investigations of the uptake of water and solutes by the rice spikelet. D. K. Mukherji emphasised the importance of breeding for physiological and biochemical as well as morphological characters.

1277 **Special conference number of the Madras Agricultural Journal.** 1956 : **43** : 215–330.

This issue of the above journal consists of 22 popular papers presented at the conference on What next in Agricultural Research and Extension [in Madras State] held at the Agricultural College and Research Institute, Coimbatore, during August 1955. N. Krishnaswamy and V. S. Raman in Cytogenetics make broad suggestions for future research. A number of other articles devote some space to achievements and aims in breeding crops: What next in rice breeding, K. Ramaswami; What next in millets and pulses research, M. Bhavanshanker Rao and B.W.X. Ponnaiya; Cotton research and extension in Madras State, N. Kesava Iyengar and V. Santhanam; The future for oilseeds research in Madras State, C. R. Seshadri; Agricultural research in groundnut cultivation, N. Srinivasalu; Castor production in the Madras State, K. Thadavarayan; Sugarcane research in Madras, S. V. Parthasarthy; What next in fruit research and extension in Madras State, T. Gopalan Nair; and Banana Research, T. Gopalan Nair, J. S. Sundararaj and V. S. Seshadri.

Mysore agricultural calendar and year book 1955 : Pp. 264.

1278 *Priyavratha Rao, S. B. A brief review of millet breeding work at Siruguppa (with special reference to the Tungabhadra project area).* (*pp. 26–30*).

A world collection of sorghum varieties has been tested at Siruguppa but only the South Indian varieties were promising. Data are provided on the yields of grain and straw of seven selections from these varieties, compared over a five-year period with those of the local variety H1. M31–2, M95–1–2 and M47–3 are recommended for growing under irrigation.

1279 *Priyavratha Rao, S. B. A review of cotton work in Bellary district.* (*pp. 30–34*).

Two lines of long-staple cotton have been developed at Siruguppa, one of which, 1821–1–1, is resistant to *Empoasca* spp. and the other, 2196–4, to *Xanthomonas malvacearum*. MA2 and Laxmi are promising, even without irrigation. Breeding of medium-staple cotton, using strains of *Gossypium herbaceum* from many sources, has continued at Hagari, and several lines have given good results, including 4136, 4287, 4327, 2–3–68 and 2–3–69.

1280 *Krishna Sastry, K. S. Sweet potato varieties and cultivation.* (*pp. 77–80*).

After three-year trials at the Mysore State Department of Agriculture, three high-yielding varieties, Hosur Green, Hosur Red and Raja, are being increased for distribution in Mysore. Varieties from America, Ceylon, China and the

Philippines and also from other parts of India have also been tested, but only a few of the American varieties and one Chinese variety appear promising under Mysore conditions. Breeding is in progress at Bangalore.

1281 *Anandaramiah, M. R. Dutch seed potatoes and their performance in Mysore State. (pp. 81–90).*

Descriptions are given of 3 commonly grown Indian varieties and of 8 of the 15 varieties received from the Netherlands under trial in Mysore. Data are provided on the average yields and seed rates in proportion to the yields of these 15 varieties as compared with one or two local varieties, the highest yield being given by Erdgold [Earth Gold].

1282 **The Agriculture of Ethiopia.** Report of Staff, Imperial Ethiopian College of Agriculture and Mechanical Arts and Agricultural Technical School, Jimma, 1955 : **2** : Pp. 106. (Mimeographed).

In addition to those described below, this report mentions trials of sweet potatoes, carrots, cabbages, lettuces, celery and beans.

Maize. In trials at Jimma including native varieties and others introduced from the USA, the native varieties were generally superior in yield, disease resistance and resistance to bird damage.

Sorghum. Several varieties from the USA grew well at Jimma but all their seed was destroyed by birds, while seed of the native varieties was only partially destroyed.

Flax. Two American varieties, Marine and Minn. B5128, proved superior to the native variety tested in yield, uniformity and early maturity.

Soya bean. The greatest yield was given by 5–100 but all varieties tested did well at Jimma.

1283 **The Agriculture of Ethiopia.** Report of Staff, Imperial Ethiopian College of Agriculture and Mechanical Arts and Agricultural Technical School, Jimma, 1956 : **3** : Pp. 89. (Mimeographed).

Trials have been carried out with sorghum, leguminous forage crops, potatoes, flax, root vegetables, cabbages, cauliflowers, spinach, mustard, lettuces, cantaloupes, water melons, cucumbers, tomatoes, okra, beans and peas.

Wheat. In variety trials carried out near Bishoftu, Kenya 5, Lee, Mida and Fortunato gave the highest yields and are considered promising for use in Ethiopia. Data are provided on the yield, weight per bushel, dates of heading and ripening, severity of leaf and stem rust infection and lodging of the ten native and eleven introduced varieties included in the test. Trials at Shashamanna and Jimma are also reported. It is thought that the superiority of the introduced varieties may be due to their greater disease resistance.

Maize. Native varieties have again outyielded introduced varieties at Jimma, although some of the varieties introduced from Ecuador have shown promise.

Barley. Data are provided on the yield, weight per bushel, dates of heading and ripening, leaf and stem rust infection and lodging of four native and four American varieties grown at Bishoftu. Highest yields were given by Monavian and Erie but Samareita, an Ethiopian variety, was markedly earlier than any others. As with wheat, the native varieties were more susceptible to leaf and stem rust than the introduced varieties.

Cotton. In trials in the Cobo-Alomata plain Acala 442 and Deltapine were the most promising.

Soya bean. S–100 has again outyielded all other varieties grown at Bishoftu and also gave the best stand but at Jimma, Acadian and CNS were the most satisfactory.

1284 **Annual Report on the Department of Agriculture (Central), Federation of Nigeria for the year 1953-54** : Pt. II : Pp. 53.

Maize. Trials of early and late-maturing varieties are reported, together with further trials of Tsolo, Big Toe, White Tuxpan, Bounty and local lines to investigate differences in varietal response to different localities. Breeding for resistance to *Puccinia polysora* has continued.

Pennisetum typhoideum. In a yield trial of 55 early maturing selections, the highest yield, 1188 lb. per acre, was given by selection 9. Crosses have been made between some of the best of these selections and the resulting hybrids will undergo field trials.

Sorghum. Evaluation of various methods of selection of guinea-corn has continued and it is concluded that normal mass selection of good heads is adequate to maintain a fairly uniform variety. The trial of 13 American varieties was repeated, with Hegari and Ladore again outstanding, but under Nigerian conditions they mature about three months earlier than the local varieties and so ripen in the middle of the wet season, with consequent deterioration from mould during storage.

Cotton. Reselection and testing of lines derived from Samaru 26C and its relatives has continued.

Cassava. The yields of clones and varieties for the years 1950–1952 are tabulated. B18 and E2 were the only Samaru clones to equal CH50 or Dan Warri in average yield of tubers.

Cacao. T38 has continued to give higher yields than Local Amelonado, an unselected variety, although the difference has not been consistent. The hybrids of T38 crossed with high-yielding selections from Trinidad have continued to show their superiority over Nigerian and Trinidad selfed seedlings.

Sesame. Data are provided on the yield of seed per acre, percentage of mature plants at the time Yandev reached maturity and days to full maturity of ten families in 1952 and 1953. Families A and B gave higher yields than Yandev Unselected and B, H and F were significantly earlier maturing.

Groundnut. Data are provided on the yields per acre of varieties included in varietal and reselection trials. 14T12, L200, 15A167, L121 and 18B138 all gave higher yields than Samaru 38 in the reselection trial.

Cowpea. New Era has proved very susceptible to eelworm, Mauritius less susceptible and Machakos partially resistant. The results of varietal trials are also reported.

1285 **Report and accounts of the Tanganyika Agricultural Corporation for the period 1st April to 30th September 1955** (1956) : Pp. 83.

Millet. Of 26 *Pennisetum* varieties tested, eight gave yields of over 2000 lb. per acre and two of these, Wuyan Bajima (from Boma) and Duaro, gave over 3000 lb. per acre.

Sorghum. The progeny of Swaziland P41 x SUK1 are the most promising of those so far produced in breeding for high yielding, white, cornaceous grained varieties. Trials of 52 varieties were continued from the previous year. High yields were obtained from Red Combine 5307–41–2–5, L33, L26, Kano and L20.

Rice. Trials of 43 varieties from a number of sources have continued and the local varieties have again given superior yields.

Soya bean. Twenty-one varieties were grown, of which Soya 16, Benares, Yellow Kedeli, Avoyelles, Dixie and Mis 28 gave the most satisfactory yields under all conditions. A number of intervarietal crosses have been made, of which the most important are considered to be Malaya x R184, Hernon 237 x R184 and MIS28EB x R184.

1286 **Annual Report of the Bechuanaland Protectorate Department of Agriculture 1955** : Pp. 24. (Mimeographed).

The results are reported of varietal trials of maize, grain sorghum, sweet sorghum for syrup and silage, groundnuts, field beans and cowpeas for seed and hay.

1287 **Report of the Secretary to the Federal Ministry of Agriculture, Federation of Rhodesia and Nyasaland, for the year ended 30th September, 1955** (1956) : Pp. 123.

The results are briefly reported of wheat, maize, sorghum, rice, lucerne, potato, groundnut and soya-bean varietal trials.

Cotton. Some lines from Albar 51 possess resistance to *Xanthomonas malvacearum* combined with good yield, ginning outturn and lint quality and are being used for breeding at the Gatooma Research Station, although they possess only poor resistance to *Empoasca* spp. Crosses have been made between strains of *Gossypium hirsutum* and Knight's *G. barbadense* BAR 4/18 in an attempt to transfer immunity to *X. malvacearum* to *G. hirsutum.* Some selections, notably S52/36 and S52/42, appear to be superior to 9L34 in yield potential and spinning quality.

1288 **Progress Report of the Dominion Experimental Substation, Delhi, Ontario 1946-1952** (1954) : Pp. 39.

During the period under review, 1946–1952, trials have been carried out of winter rye varieties for use in rotation with flue-cured tobacco. Trials of tobacco varieties are reported and descriptions, including cultural requirements, of 12 varieties are given. Delcrest has been released during this period and breeding is continuing, strains R21 and R11 showing promise.

1289 **Progress Report of the Dominion Experimental Farm, Agassiz, British Columbia 1948-1952** (1954) : Pp. 38.

The work carried out at Agassiz, BC, during the years 1948–1952 is reviewed. Breeding has been undertaken with oats, barley, cocksfoot, ryegrass, potatoes, raspberries, strawberries and broccoli, while variety trials have been carried out with a number of other crops.

1290 **Progress Report of the Cereal Breeding Laboratory, Winnipeg, Manitoba, for 1949-54** (1956) : Pp. 37.

This report summarizes the progress made during the period reviewed in the improvement of common and durum wheat, oats, barley and oilseeds and in the study of cereal diseases at the Cereal Breeding Laboratory, Winnipeg.

1291 **Report of the Minister of Agriculture of the Province of Ontario, Ontario Department of Agriculture, for the year ending March 31st, 1956.** Pp. 215.

The results are briefly reported of trials of oats, maize, barley, timothy, lucerne, red and white clover, onions and sweet corn, including, for timothy, lucerne, clover and onions, recommendations of newer varieties suitable for use in Ontario.

Potato. Several seedlings have been developed, at the Ontario Agricultural College, which combine high resistance to *Streptomyces scabies* with good horticultural characteristics. Brown-ring negative mutants of *S. scabies* have been found to differ in their ability to oxidize tyrosine without any corresponding change in pathogenicity. Two instances of synergistic growth and one of apparent anastomosis have been found in genetic studies of mutants of *S. scabies*.

Cucumber. 130 strains have been tested for resistance to *Colletotrichum lagenarium*. Studies of F_2 and back-cross progeny suggest that resistance is controlled by multiple or single factors. Protoplasmic disintegration and tissue collapse were slower in resistant tissue and globules of red-staining, gum-like material, of unknown significance, were present.

Tomato. Grafts involving 18 genetic combinations have been made in order to study the effect of the scion on the stock. The expression of the genes *em* (early mottled leaves), *m* (mottled leaves) and *h* (hairless) and the growth of *hl* and *wi* (wiry) were modified in the grafts. Green-stem mutants with the genes *a*, *al* and *aw* have been found to remain green under conditions of nutrient deficiency.

Abstracts for joint meeting of Western Division of the Canadian Society of Agronomy and the Western Society of Crop Science, United States of America, held at Lethbridge, Alberta, Canada, August 1-3, 1956 : unpaginated. (Mimeographed).

1292 *Watson, C. A. & Hehn, E. R. Location and year effect on micro-quality tests.*

The flour quality of 119 F_2 lines from Yogo x Turkey/Oro–221 was determined in 1953, 1954 and 1955 by means of a dough-ball test and variations within selections due to locations and years determined, with a view to estimating the value of this test for selecting for quality in the early stages of a breeding programme.

1293 *Peake, R. W., Cormack, M. W. & Downey, R. K. Field and greenhouse tests for resistance to bacterial wilt.*

Selections of lucerne from various localities in Alberta have been screened for their reaction to *Corynebacterium insidiosum* and resistant selections increased for breeding and crossed with selections resistant to crown rot.

1294 *Elliott, F. C. Correlations of certain quality characteristics in Pacific Northwest spring wheat selections.*

Atlas 50 and Atlas 66 have given higher yields and higher protein contents than other varieties tested in the eastern region of the USA. Correlations between yield and protein content, test weight and protein content, whole grain protein and endosperm protein and other correlations are discussed.

1295 *Gross, H. Alfalfa performance—Brandon 1952–1955.*

Yield data indicate that Ladak is a superior variety for hay production while eight French varieties also tested did not give higher yields than varieties already recommended. Vernal and creeping-rooted strains from Swift Current are promising.

1296 *Kaufmann, M. L. & Shands, H. L. A preliminary report on back-crossing for lodging resistance.*

Back crossing has been used at Madison, Wisconsin, in an attempt to combine lodging resistance with the malting quality of Kindred barley, and the methods of selection and testing are discussed. Lodging resistance equal to that of the donor parents has been found in some second and third back-cross lines and resistance superior to that of Kindred in some fourth and fifth back-cross lines.

1297 *Elliott, F. C. The use of the translocation technique in transferring disease resistance from tall wheatgrass to common wheat.*

The use of X rays, thermal neutrons, P^{32} and S^{35} in inducing translocations to expedite the transfer of resistance to bunt and rust from *Agropyron elongatum* to hexaploid wheats is described.

1298 *Ausemus, E. R. Breeding for rust resistance in wheat.*

A brief history of breeding for rust resistance is given, mention being made particularly of the use of ionizing radiations.

1299 *Peterson, R. F. Accomplishments of the pedigree and backcross methods in wheat breeding.*

A report is given of the development of wheat breeding in North America, Australia, South

America and other areas, based on published literature and replies to a questionnaire. The back-cross and pedigree methods of breeding are discussed.

1300 *Metcalfe, D. R. & Johnston, W. H. Some aspects of breeding for loose smut resistance in barley.*

A method is described by means of which large populations of hybrids may be rapidly selected during the early generations of a breeding programme, particular reference being made to breeding for resistance to *Ustilago nuda.*

1301 *Andrews, J. E. Breeding for winter-hardiness.*

Theoretical considerations of improvement in the winter hardiness of wheat varieties are discussed.

1302 *McKenzie, H. Sources of resistance for breeding sawfly-resistant wheats.*

Sources of resistance to *Cephus cinctus* include (1) S–615, a solid-stemmed variety of *Triticum aestivum* from which Rescue and Chinook derive their resistance, (2) hybrids of *T. aestivum* and *Agropyron elongatum*, (3) varieties of *T. durum* with thick-walled stems, (4) three *Triticum* species with solid stems, *T. polonicum*, *T. dicoccum* and *T. turgidum*, (5) two species with thick-walled stems, *T. pyramidale* and *T. orientale* and (6) a hollow-stemmed wheat with $2n = 42$, PI170924. The possibility of using these sources in a breeding programme is discussed.

1303 Servicio Cooperativo Interamericano de Agricultura. Ministerio de Agricultura, Guatemala, C.A. Informe anual 1955. (**International Cooperation Administration for Agriculture. Ministry of Agriculture, Guatemala, CA. Annual report 1955**). Pp. 167.

Wheat. Considerable success has been recorded with selections of Supremo 211 and Supremo 51. Segregating hybrids received from Mexico have been selected in Guatemala and some of them are thought promising, especially those from (Supremo x Kenya) x (Perú x Supremo) x Perú.

Maize. A study has been made of the local maize races of Guatemala and of 2000 lines from the USA, very few of which proved superior to the local strains. Some of the Iowa hybrids in which the single cross 187–2 x L317 formed one of the components gave good yields in the coastal belt and at altitudes of 4000–5000 ft.; above 7000 ft. the only hybrid that did well was (92A–46 x 20–47 2s) x (15A–46 2s x 1483–45 5s). The Colombian variety ETO has also given good results in the coastal belt. Some of the local strains have proved resistant to rust and leaf blight.

Cacao. On estates in the southern coastal belt of Guatemala, trees bearing more than 100 fruits exceeding 8 cm. in length are being selected and their yields measured.

Rubber. A number of clones imported from Brazil, Costa Rica and Florida have been tested. By selection from crosses of high-yielding clones from the Far East with resistant Brazilian clones, six promising clones resistant to South American leaf blight have been produced.

Observations were made on 370 plants obtained from seed and five of them were selected for starting clones, though none are so far equal to those from the Far East.

Beans. A collection of some 800 *Phaseolus* lines, some local and some from Mexico, has been studied and a number of selections have been made. On the whole the local forms were the most promising.

Abstracts of the Annual Meetings of the American Society of Agronomy, Cincinnati, Ohio 1956 : Pp. 102. (Mimeographed).

1304 *Foy, C. D. & Barber, S. A. Magnesium absorption and utilization by two inbred lines of corn. (p. 26).*

Ohio 40–b was found to have a lower content of magnesium in the leaves and a higher content in the stems than Indiana Wf–9.

1305 *Adams, M. W. Estimates of genetic variance for disease reaction and root proliferation in alfalfa. (p. 64).*

Estimates of genetic variance for the reaction of clonal and intercross tetraploid lucerne progeny to *Pseudopeziza medicaginis*, *Uromyces trifolii* and the root-proliferating character have been compared with expectations based on Mather's biometrical genetic model but only partial agreement has been found.

1306 *Alexander, D. E. The genetic induction of autotetraploidy: a proposal for its use in corn breeding. (p. 64).*

$4n$ and $3n$ kernels have been produced by a breeding programme involving the use of the recessive gene *e* (elongate) which causes the production of diploid eggs when homozygous.

1307 *Allan, R. E., Heyne, E. G. & Jones, E. T. Relationship of sources of Hessian fly and leaf rust resistance in several wheat crosses involving a white winter wheat, PI 119344–7. (p. 64).*

Greenhouse tests were conducted on the F_3 lines of two crosses, X52AT [Pawnee x (Chiefkan-Hard Federation-Kawvale x PI 119344–7)] and X52AS [COT x (Chiefkan-Hard Federation-Kawvale x PI 119344–7)], using two strains of *Mayetiola destructor*, one from Marshall County, Kansas and the other from Imperial, Nebraska. For the cross X52AS a 1 : 2 : 1 ratio was found using both strains but with X52AT this ratio was only found with the Marshall County strain. F_2 plants from the cross (Chiefkan-Hard Federation-Kawvale x PI 119344–7) x Java (h_4 factor) did not segregate for reaction to the Imperial strain.

Leaf-rust studies were conducted on F_4 progeny of both crosses. Resistance to race 5 was controlled by a single partially dominant gene derived from Hard Federation; this gene is linked to the gene from PI 119344–7 for resistance to the Hessian fly with a recombination value of about 12%.

1308 *Atkins, I. M. & Finney, K. F. Quality characteristics of two pairs of isogenic lines of wheat. (p. 64).*

Measurements of quality were made on two pairs of isogenic lines, grown at several localities over a three-year period. One pair differed only in the presence or absence of awns, the other in seed-coat colour, one being white and one red. The test weight of the awned segregate was slightly higher in all instances.

1309 *Bauman, L. F. Results of tests designed to detect non-allelic gene interaction (epistasis) in maize. (pp. 64–65).*

Two inbred lines and the single cross between them were crossed to an unrelated tester strain to determine the presence and amount of epistasis. Significant evidence of epistasis for ear height was found in four of the five groups tested.

1310 *Briggle, L. W. Cytoplasmic-genotypic interactions in three male-sterile corn types. (p. 65).*

Incomplete male sterility occurs in the single cross M1984 x M14, while the reciprocal cross M14 x M1984 is fertile. The segregation of fertile to male-sterile plants in the F_2 of M1984 x M14 approaches 1 : 1, suggesting that not all the pollen produced by the F_1 is viable. Back crosses of M1984 x M14 to M14 were predominantly male sterile, while back crosses to M1984 were fertile, as were all populations using M14 as the female parent. It is suggested in explanation of these observations that male sterility is the expression of a major gene from M14 together with a cytoplasmic factor from M1984. Limited data indicate some type of selective fertilization in the case of a plant heterozygous for the fertility-restoring genes from Ky21 in the presence of either the Vg or Reid cytoplasmic components.

1311 *Brooks, S. N., Likens, S. T. & Keller, K. R. Indications of somatic mutations for several inherent characteristics in hops. (p. 65).*

Data from 20 clonally propagated lines of the variety Fuggle, 10 high and 10 low yielding plants, indicate consistent differences among selections for yield and percentages of humulone and lupulone. The genetic coefficients of variation for these characters indicate a relatively wide variation among selections for each factor.

1312 *Day, A. D. & Dickson, A. D. Association between nitrogen percentage and certain morphological characteristics in barley. (p. 66).*

Crosses were made between varieties with low and high nitrogen percentages, in which certain morphological characters segregated. The difference between the mean nitrogen percentage of the two homozygous groups of segregates from a cross was tested for significance by the *t* test. Association was found between nitrogen percentage and (1) the two-rowed *vs* six-rowed character determined by a gene in linkage group I and (2) the covered *vs* naked kernel character determined by a gene in linkage group III, with naked-kernel segregates having a significantly lower mean nitrogen percentage than covered-kernel segregates. No association was found between nitrogen percentage and black *vs* white hull, blue *vs* white aleurone or rough *vs* smooth awns.

1313 *Dunlap, W. D. & Adams, M. W. Evaluating mode of inheritance in alfalfa by use of intra-class correlation. (p. 66).*

The observed values for r_I in tetraploid lucerne for both qualitative and quantitative characters range from ·25 to ·59 suggesting that disomy occurs rarely, tetrasomy with some double reduction occurs more frequently and "heterosomy" occurs most frequently.

1314 *Duvick, D. N. Yields and other agronomic characteristics of cytoplasmically pollen sterile corn hybrids, compared to their normal counterparts. (p. 66).*

Normal and sterile forms, with T or S cytoplasm, of four double-cross and two single-cross hybrids were grown in three localities at six rates of planting. In the case of sterile forms with T cytoplasm no statistically significant difference was found between the yields of the normal and sterile forms, but analysis of variance showed three interactions to be highly significant: (1) cytoplasms x hybrids, (2) cytoplasms x localities and (3) cytoplasms x rates of planting. In the case of sterile hybrids with S cytoplasm, analysis of variance showed a highly significant difference between cytoplasms in favour of the sterile, and a highly significant interaction between cytoplasms and localities. In both cases the sterile hybrids produced fewer barren plants and fewer tillers than the normal plants.

1315 *Foster, A. E., Ross, J. G. & Franzke, C. J. Genetic behavior of colchicine-induced mutants in* Sorghum. (*pp. 66–67*).

Studies were made on F_2 and F_3 populations from crosses between colchicine-induced mutants and their untreated full sibs to determine the distribution of the mutant genes on the chromosomes. No aberrant chromosome behaviour occurred at meiosis. Two mutant characters, presence of awns and seedling-base colour, were simply inherited and not linked, nor was evidence of linkage found between these characters and quantitative mutant characters. Five other mutant characters, days to heading, height, number of tillers and width and length of leaf, appeared to be controlled by a number of genes with no consistent correlation between the inheritance of any two of them.

1316 *Hittle, C. N. & Jackobs, J. A. Variation among seed certification classes of Kenland red clover.* (*p. 67*).

An increase in vigour of up to 17% was found in advanced generations of Kenland red clover breeder's seed.

1317 *Horner, E. S., Hull, F. H., Chapman, W. H., Lundy, H. W. & Lutrick, M. C. Effectiveness of recurrent selection for specific combining ability in corn.* (*pp. 67–68*).

Three cycles of recurrent selection for combining ability with the single cross F44 x F6 have been completed and the population averages have been 93, 95 and 107% of the check hybrid for the first, second and third cycles respectively.

1318 *Jensen, N. F. The inheritance and influence of a dominant chlorophyll deficient character in wheat.* (*p. 68*).

The effect of a chlorophyll deficient character inherited as a simple dominant was measured in F_2 and F_3 progenies of a cross with Yorkwin. In plants homozygous for this character significant decreases were found in yield, weight of 1000 kernels and height but not in number of tillers per plant.

1319 *Kelleher, T., Robinson, H. F. & Cockerham, C. C. Analysis and interpretation of quantitative data on inbred lines and F_1 crosses in corn.* (*p. 68*).

Measurements of quantitative characters in inbred lines and hybrid progenies of Jarvis and Indian Chief were analysed by partitioning the variance among hybrid progenies into genetic, environmental and interaction components of variance and by calculating the regression of offspring on parental sum and parental product. Results from both methods in the Jarvis hybrid population indicated partial to complete dominance of genes concerned with yield but this interpretation did not account for the results obtained with the Indian Chief hybrid population.

1320 *Leng, E. R. Preliminary evaluation of the use of the dwarfing gene "brachytic-2" for production of feasible commercial corn hybrids.* (*p. 69*).

A breeding programme to introduce the dwarfing gene brachytic-2 into the four parental lines of the hybrid US 13 has reached the third generation of back crossing to the recurrent parent and the fourth and fifth generations of selfing. Some inbred lines, particularly WF9, gave a high proportion of phenotypically undesirable dwarf segregates. Single-cross dwarfs yield as much grain as their normal counterparts but only about two thirds as much dry stover and are highly resistant to lodging.

1321 *Linden, D. B. & Pinnell, E. L. The inheritance of a source of fertility restoration in Texas type of cytoplasmic male sterile* Zea mays. (*p. 69*).

The presence of a single dominant gene capable of restoring fertility in Texas sterile cytoplasm has been detected from back-cross data of inbred A293 crossed with 12 other inbreds, Oh5, B9A, W22, Oh43, Oh51A, A73, B164, A223, A286, A295, A375 and Os420, and its position in A293 determined by means of translocation studies. Linkage was obtained with translocation 1–3 (5982–2), with a break in the long arm of chromosome III, and with translocation 1–3 (5883–1), with a break in the short arm of chromosome III. In both cases breaks occurred in the short arm of chromosome I. Recombination values place the gene $> \cdot 77$ of the distance from the centromere to the end of the short arm of chromosome I. Observations were also made on the effect of environment on the expression of the genes restoring partial fertility in inbred A71.

1322 *Moll, R. H., Thompson, D. L., Harvey, P. H. & Comstock, R. E. The inheritance of resistance to brown spot of corn.* (*p. 69*).
The inheritance of resistance to *Physoderma zeae-maydis* is being investigated, using a cross between a susceptible inbred NC7 and a resistant inbred GT154, by the partitioning method of genetic analysis described in *PBA*, XXVI, Abst. 2911.

1323 *Murphy, H. C., Zillinsky, F. J., Sadanaga, K. & Simons, M. D. A stem- and crown-rust resistant tetraploid from* Avena abyssinica *x* Avena strigosa *cross.* (*p. 69*).
A fully fertile tetraploid F_3 with $2n = 28$ has been developed from the cross *Avena strigosa* CD3820 ($2n = 14$) x *A. abyssinica* CD4549 ($2n = 28$) and has been found to possess the high resistance to stem and crown rust of the diploid parent. F_4 and F_6 progenies from F_3 Abd. 101 are resistant to stem rust races 6, 7, 7A and 8 and crown rust races 202, 203, 216, 258 and 276, while F_3 Abd. 100 progenies show similar resistance to stem rust but segregate for resistance to crown rust. Hybrids between these tetraploids and *A. sativa* have been readily obtained when the tetraploids are used as the female parent.

1324 *Murphy, R. P. & Lowe, C. C. Methods of breeding smooth bromegrass.* (*pp. 69–70*).
Several selected clones from open pollinated and one-year inbred progenies have proved superior to Lincoln, Canadian Common and others, and one, named Saratoga, has been released for seed production.

1325 *Nielsen, E. L. Cytology and breeding behavior of a partially fertile tetraploid Agroelymus.* (*p. 70*).
The F_2 progeny from a natural hybrid between *Agropyron trachycaulum* and *Elymus glaucus* contained plants morphologically similar to the presumed parents and one plant which was completely seed sterile. F_3 and F_4 populations were highly uniform in morphological characteristics. Pollen abortion occurred in most plants after tetrad formation but less than half the pollen sterility could be attributed to meiotic disturbances, fertility and sterility apparently being controlled by cytoplasmic relations between the parents.

1326 *Osler, R. D., Smith, D. L. & Palacios, G. Effect of visual selection upon combining ability in corn.* (*p. 70*).
Sixty-seven of the possible single crosses among seven local and seven introduced varieties were compared in respect of yield with single crosses of their derived S_5 and S_6 lines. Seven of the local x local lines and 41% of the single crosses were higher yielding than they were as S_1 crosses. It was concluded that the value of visual selection for yield during selfing is not solely dependent on whether the original S_1 lines were derived from local or introduced varieties.

1327 *Peacock, H. A. & Wilsie, C. P. Selection for resistance to seed shattering in birdsfoot trefoil,* Lotus corniculatus *L.* (*p. 70*).
Six clones showing a tendency to retain their seeds after the fully mature stage were interpollinated in bee cages and their seed pods subjected to different degrees of relative humidity in desiccation chambers; 35% relative humidity for 72 hours was found best for distinguishing resistant clones which did not shatter from others with up to 55% shattering. Selection for nonshattering is being continued.

1328 *Pinnell, E. L., Rinke, E. H. & Caldwell, A. C. The response of corn hybrids to levels of plant population and fertilizer application.* (*pp. 70–71*).
Double-cross trials were conducted at seven localities using two levels of fertilization and three levels of population density. Hybrid x population interactions were significant, though less so than hybrid x locality interactions, and were related to the ability of the earlier hybrids to yield relatively better at higher population densities. Wf9 x Oh51A test crosses gave increasingly higher yields than A73 test crosses as the population density increased.

1329 *Powell, L. M. & Pfeifer, R. P. The effect of controlled limited moisture on seedling growth of Cheyenne winter wheat.* (*p. 71*).
Significant differences were found in respect of drought hardiness in 670 selections of Cheyenne winter wheat, of which 5% differed after one generation beyond the expected limits of environmental variation. A correlation coefficient of ·72 was found when the responses of different generations to drought were compared. The use of mannitol solutions for determining differences in drought hardiness is recommended.

1330 *Robinson, H. F., Comstock, R. E. & Harvey, P. H. Investigation of genetic differences in two open-pollinated varieties of corn.* (*p. 71*).
Data obtained from two-year studies of progenies from biparental reciprocal crosses of Jarvis and Indian Chief were on the whole consistent with an additive model assuming only two alleles per locus and no epistasis in the case of the genes concerned with yield.

1331 *Rubis, D. D. A comparison among breeding methods for transferring factors for earliness between safflower lines.* (*pp.* 71–72).

Safflower varieties introduced from India and grown in Arizona flowered and matured approximately ten days earlier than N–10 but were low in yield and oil content. Comparisons have been made between three breeding methods, (1) pedigree selection, (2) back crossing and (3) a combination of back crossing and cumulative selection, with a view to transferring factors for earliness from A–1186 to N–10.

1332 *Schafer, J. F., Caldwell, R. M., Patterson, F. L. & Compton, L. E. Leaf rust resistance of Warden and related wheats.* (*p.* 72).

F_2 populations of crosses among Warden, resistant to 13 races, Exchange, resistant to 18 races, CI 12660 and Kenya Farmer, resistant to all but 3 races and various susceptible varieties were tested for their reaction to at least two of races 5, 45 and 104B. Three major gene pairs for resistance have been identified, (1) providing resistance to races 5, 45 and 104B, present in Exchange and Warden, (2) providing resistance to races 5 and 45, present in all four resistant varieties, and (3) providing resistance to race 45, present only in CI 12660 and thought to be the same as *Lr 1* of Malakof. Crosses between Kota, which is susceptible, and Exchange or CI 12660 produced F_2 segregates more resistant than the resistant parent. One of the F_2 segregates from a cross between Exchange and Aniversario [Anniversary] was resistant to race 35 but all the other segregates were susceptible to the three to five races tested, as were all the F_2 segregates from crosses of Exchange with Frontana and La Previsión 25.

1333 *Schonhorst, M. H. & Davis, R. L. Inheritance of viable pollen in alfalfa.* (*p.* 72).

Reciprocal crosses between clones of *Medicago falcata* with high and low percentages of viable pollen produced mixed progeny of which 75% had high percentages of viable pollen. The amount of viable pollen produced by the progeny of selfed populations of the high and low parent and of high, low and intermediate plants from the F_1 was generally similar to that of their S_0 or F_1 parents.

1334 *Stanford, E. H., Houston, B. R. & McClain, E. F. Studies on resistance to* Fusarium oxysporum *f.* medicaginis *in alfalfa.* (*p.* 72).

A survey of 42 strains of lucerne showed that most varieties contain some plants resistant to *Fusarium oxysporum* f. *medicaginis.* F_2 and F_3 progeny of a cross between *Medicago sativa* var. *gaetula*, which is resistant, and a white-flowered form of California Common, which is susceptible, were inoculated in the seedling stage in the greenhouse and families were recovered from the F_3 similar in response to both parents.

1335 *Stephens, J. C. A breeding method to eliminate tall mutations in combine grain sorghum varieties and hybrids.* (*pp.* 72–73).

An outline is given of a breeding programme designed to replace the height factors of Kafir sorghum with those of milo sorghum.

1336 *Van Schaik, P. H. & Probst, A. H. The inheritance of inflorescence type in soybeans.* (*p.* 73).

Data obtained from the F_2 and F_3 progeny of crosses between Mukden and T109 with sessile inflorescences and Accession 2300–2 and Midwest with pedunculate inflorescences indicate that a single allelic pair is involved, with complete dominance of the pedunculate type. Dominance of long over short peduncle and large over small number of flowers was also found, with highly significant correlation coefficients for peduncle length and number of flowers. No linkage was detected between genes affecting determinate growth type and pedunculate inflorescences.

1337 *Vogel, O. A. & Craddock, J. C. (Jun.). Use of a partially male sterile semidwarf female parent in producing hybrid seed for heterosis studies in wheat.* (*p.* 73).

Norin 10 [Ministry of Agriculture and Forestry 10], a partially male-sterile semidwarf variety, was found to give 2–21% outcrossed progeny when planted in the centres of four varietal increase plots. When grown with Golden 95%, and when grown with the other three varieties 30%, of the hybrids were produced by pollination by Golden. The F_1 plants could be easily identified as to source of pollen, being 8–16 in. taller than Norin 10, but only one of the F_2 segregates from the four possible crosses showed sufficient heterosis to warrant further study and none of the F_3 populations gave higher yields than their better parent.

1338 *Weibel, D. E., Atkins, I. M. & Porter, K. B. An unusual combination of test weight and quality in winter wheat.* (*pp.* 73–74).

The high test weight of Blackhull has now been combined with high quality by crosses involving

Cimarron, a selection from Blackhull x Hard Federation, which is itself of inferior quality. Test weight equal to Red Chief and quality equal to Comanche is possessed by the progeny of the cross (Kanred-Hard Federation-Tenmarq)-(Med.-Hope) x Cimarron, CI 13023.

1339 *Williams, L. F. Natural selection in variety mixtures of soybeans.* (*p. 74*).

A mixture of six strains of soya beans was grown at six localities in Illinois for eight years and it was found that locality had a marked effect on the varietal composition of the advanced mixtures but no close relation was found between yield, height, maturity or lodging resistance and varietal composition. The highest average increase was shown by Man.13–177 and the greatest decrease by Dunfield but each strain was found to maintain itself at at least one locality.

1340 *Yao, S. Y., Henderson, M. T. & Jodon, N. E. Cytological evidence of cryptic structural differentiation in the chromosomes as a cause of sterility in hybrids between* indica *and* japonica *races of cultivated rice,* Oryza sativa. (*p. 74*).

A cytological study was made of six partially sterile hybrids and one fertile hybrid between the two races, *indica* and *japonica*, of *Oryza sativa* and also of two fertile parent plants. Metaphase of meiosis I was entirely normal in the sterile hybrids, with regular formation of 12 bivalents, and anaphase I was normal in five of the six sterile hybrids, with 12 chromosomes moving to each pole. In the remaining sterile hybrid and in the fertile hybrid chromatin bridges were found in less than 5% of the microsporocytes, indicating heterozygosity for paracentric inversions. Detailed investigations of the pachytene stage in four of the sterile hybrids revealed inversions, mainly of the pericentric type, in all cases. The chiasma frequency per bivalent was found to be similar in both sterile hybrids and fertile parents. It is suggested that sterility may be caused by structural differences in the chromosomes resulting from inversion.

1341 *Zillinsky, F. J., Murphy, H. C. & Grindeland, R. Inheritance of seed color and resistance to races of stem and crown rust in diploid* Avena strigosa. (*p. 74*).

Reciprocal crosses were made between CD 3820, with grey-striped seed, and CI 4748 with white seed. The former is resistant to stem-rust races 6, 7, 7A and 8 and crown-rust races 202, 258 and 276, while the latter is only resistant to crown-rust race 276. The F_2 segregation for reaction to the four stem-rust races indicated that two independent dominant genes conditioned resistance to all races in four of the F_1 families but in two other families the ratios could not be determined on a factorial basis and it is concluded that CD 3820 possesses different genes for resistance to stem rust. The F_2 segregation for reaction to crown-rust races 202 and 258 was identical for both races and indicated that at least three independent dominant genes were involved. No segregation for reaction to crown rust race 276 occurred, indicating that the same gene was present in both parents. Grey-striped seed colour was controlled by a single dominant gene and inheritance of this character, stem rust resistance and crown rust resistance were found to be independent.

1342 *Zuber, M. S., Grogan, C. O., Michaelson, M. E. & Gehrke, C. W. Correlation of field stalk lodging, two stalk rotting fungi and chemical content of stalks in corn.* (*pp. 74–75*).

All possible F_1 single crosses and first-generation back crosses were made between three lodging-resistant and three lodging-susceptible inbred lines and their field stalk lodging determined in two localities. In a separate planting these crosses and their parents were inoculated with *Diplodia zeae* and *Gibberella zeae* and their responses determined. Measurements of the water, fibre, lignin, cellulose, nitrogen, ash and fat contents of mature stalks were obtained from healthy plants from another planting and all possible correlation coefficients were calculated between lodging, localities, the two fungi and the seven chemical constituents. Details of correlations are given; no correlation was found between lodging and either of the fungi.

1343 *Coffindaffer, B. L. & Burger, O. J. Response of alfalfa varieties to photoperiod.* (*p. 76*).

Three photoperiods of 16, 14 and 10 hours replicated eight times were imposed on Vernal, Narraganset and Williamsburg grown alone and in association with *Dactylis*. Williamsburg was found to contain more calcium and Vernal more phosphorus than the other varieties but the amounts varied according to the length of the photoperiod, potassium content being lowest in plants grown under 10-hour photoperiods and phosphorus lowest in plants grown under 16-hour photoperiods. Vernal showed less response to decrease in production as the photoperiod decreased.

Proceedings, abstracts of papers and addresses of the 53rd Annual Convention of the Association of Southern Agricultural Workers held in Atlanta, Georgia, February 6, 7, 8, 1956 : Pp. 214.

1344 *Craigmiles, J. P. & Jensen, N. F. Determining disease losses in oats. (pp. 44–45).*

Isogenic lines of oats derived from Ithacan x Victoria were used in an investigation of the reduction in grain yield caused by *Helminthosporium victoriae.* After selfing for 11 generations the plants segregated for reaction to *H. victoriae.*

1345 *Lebedeff, G. A. Studies of the inheritance of loose pericarp in corn. (p. 45).*

Data obtained from crosses between GE54 and Mp1 and between these two and other inbreds indicate that multiple factors are involved in the expression of degrees of looseness or wrinkling of the pericarp in maize.

1346 *Buckner, R. C. & Fergus, E. N. Selection within inbred lines of tall fescue* (Festuca arundinacea, *Schreb.) for palatability. (pp. 45–46).*

An account is given of the progress made since 1950 in improving the palatability of *Festuca arundinacea* by inbreeding selected lines.

1347 *Coleman, O. H. Red rot resistance in Rex sorgo. (p. 47).*

Two groups of plants of *Sorghum vulgare,* susceptible and resistant respectively to *Colletotrichum graminicolum,* were selfed for five generations, severely infected and symptomless plants being selected from their respective groups in each generation. No significant interaction was found between selections and years of selfing, nor was there any change in the average disease rating of the two groups after five years of selfing.

1348 *Taylor, N. L. & Henson, L. Selection for southern anthracnose resistance in red clover varieties. (pp. 47–48).*

Selection for resistance to *Colletotrichum trifolii* has been carried out with 20 varieties of red clover. After one cycle of selection gains in resistance of 2–39% were recorded in all varieties, the highest gains being shown by the less resistant varieties. High correlation was found between the resistance of mature plants and 21-day old plants.

1349 *Dean, J. L. & Coleman, O. H. A preliminary report on the reactions of sorghum varieties to infection by sugarcane mosaic virus. (p. 48).*

Three types of response were obtained in 71 sorghum varieties inoculated with sugar-cane mosaic virus from Co.290; (1) mosaic mottling was shown by 44 varieties, (2) delayed development of a mild mottling occurred in 8 varieties in one of which the symptoms disappeared after a few days and (3) 19 varieties developed necrotic spots of various shapes, with or without mottling. In some varieties the necrosis was sufficiently severe to cause death, especially when very young plants were inoculated.

1350 *Pate, J. B. Interspecific hybridization as a means of improvement in Sansevieria. (pp. 48–49).*

Hybrids have been made between *Sansevieria trifasciata* and *S. deserti, S. ehrenbergii, S. liberica, S. aethiopica* and *S. parva* with the object of improving growth rate, disease resistance, cold tolerance and fibre production. F_1 progeny of *S. trifasciata* x *S. deserti* are relatively free of disease and vigorous, producing leaves long enough to yield fibres about twice as quickly as *S. trifasciata,* and are equal to *S. trifasciata* in cold tolerance and fibre production. Progeny of *S. trifasciata* x *S. liberica* are sterile, and their leaves are too short for mechanical processing.

1351 *Brinkley, R. M., Hanson, C. H. & Cope, W. A. Interfertility, and relative performance and quality of diploid and induced autotetraploid forms of sericea, Korean and Kobe lespedeza. (p. 49).*

Autotetraploid lines of *Lespedeza cuneata, L. stipulacea* and *L. striata* were produced by colchicine treatment to determine (1) whether interspecific hybrids could be obtained from any of the possible diploid and tetraploid matings and (2) the agronomic characters of the tetraploid forms. No viable hybrids were obtained from any of the crosses attempted. In all cases the tannin content of the tetraploids was higher than that of the diploids, while their total nitrogen, CaO and P_2O_5 content was lower.

1352 *Hanson, C. H., Brinkley, R. M. & Cope, W. A. Heterosis, factors affecting natural crossing, and their implications in breeding sericea lespedeza. (pp. 49–50).*

It has been found in 33 lines of *Lespedeza cuneata* that spaced progenies from chasmogamous flowers yield more than progenies from cleistogamous flowers. Since cleistogamous flowers are self pollinated while about 75% outcrossing occurs with chasmogamous flowers it is suggested that the greater vigour of the progeny of chasmogamous flowers may be due to heterosis. Factors affecting the production of chasmogamous flowers have been investigated with a view to obtaining the maximum outcrossing for seed production.

1353 *Eckhardt, R. C. The incorporation of the* Ga^s Ga^s *genes into cytoplasmic male sterile and fertility restorer inbred lines. (p. 50).*

A breeding programme is outlined which has as its aim the substitution of the gene Ga^s for *ga* in white dent inbreds: (1) a white fertility-restorer inbred (*cms Rf Rf ga ga*) with male-sterile cytoplasm is pollinated by a popcorn inbred known to be *rf rf* Ga^s Ga^s, thus introducing the Ga^s gene, (2) the white inbred to be converted is used as the male parent in a cross with this hybrid, (3) the segregates are classified as to genotype by pollen production (*Rf*) and as to Ga^s by appropriate outcrosses and (4) isogenic inbreds of six genotypes are isolated by repeated back-crossing. The six genotypes to be isolated are *rf rf ga ga*, a fertility restorer for *ga ga* dent material, *cms rf rf ga ga*, a male-sterile inbred for *ga ga* dent material, *rf rf Ga Ga*, a fertile non-restorer *Ga Ga* inbred, *cms Rf Rf Ga Ga*, a fertility restorer *Ga Ga* inbred and *cms rf rf Ga Ga*, a male-sterile *Ga Ga* inbred.

1354 *Morris, H. D., Fleming, A. A. & Kozelnicky, G. M. Differential response of five corn varieties to varying fertility levels in the Georgia Piedmont. (p. 54).*

Four maize hybrids and one open pollinated variety have been grown for three years at four rates of application of fertilizer. Dixie 22 outyielded all others at all fertilizer levels, while the open-pollinated variety was consistently the lowest yielding. The superiority of the hybrids over the open-pollinated variety was more marked during dry seasons and at higher levels of application of fertilizer.

1355 *Wells, D. G. Effects of different photoperiods and temperatures upon heading responses of three varieties of wheat and three varieties of barley. (pp. 65–66).*

Kenbar, Mississippi Sel. 50–1–9 and Manchuria CI2330 barleys and Chancellor, Taylor and Coastal wheats were grown from November to March under photoperiods of 8, 14, 16, 18 and 20 hr. and normal daylight, in a temperature range of 67°–80° F., and under 16-hr. photoperiods and normal daylight in a temperature range of 60°–80° F. In the case of the barley varieties, heading was earlier under the longer photoperiods. Under 16-hr. photoperiods, Kenbar headed earlier in the warmer greenhouse while the other two varieties headed earlier in the cooler house. Only Manchuria CI2330 headed under 8-hr. photoperiods, and this variety headed earlier than the other two under normal daylight.

The wheat varieties also headed earlier under longer photoperiods. Chancellor and Taylor headed earlier in the warmer house under 16-hr. photoperiods, while Coastal headed earlier in the cooler house. Plants of Chancellor and Coastal grown in the cooler house headed later than plants started outside and subsequently transferred to the cooler house, while the opposite response was shown by Taylor. Only Coastal headed earlier when transferred to the warmer house from outside.

1356 *Caffey, H. R. & Wells, D. G. Variants observed in wheat and barley as a result of treatments with thermal neutrons and X-rays. (p. 66).*

Seed of Anderson wheat and Kenbar barley was treated with two, three, four and five hours of thermal neutron radiation and with X-ray doses of 12,500 and 20,000 r.

Nearly half of the Anderson lines segregated for dwarf or late-maturing plants; the dwarf plants were all abnormal in other respects also and mutant head types were common. Some segregation was found for reaction to races 122 and 58 of *Puccinia rubigo-vera* var. *tritici*, one line containing seedlings resistant to both races. Other lines segregated for reaction to *Erysiphe graminis*.

A number of variants were observed in Kenbar lines, including sterile plants, extremely dwarfed plants, adult and seedling foliage colour types and various degrees of dwarfing.

1357 *Douglas, W. A., Ingram, J. W. & Henderson, C. A. Decreasing earworm damage in dent corn by use of resistant inbreds. (p. 134).*

Earworm-damage ratings have been made for hybrids, test-cross and single-cross maize in Mississippi, Texas, Louisiana and Tennessee. Some crosses showed better resistance than others but details are not given.

1358 *Barham, W. S. & Sasser, J. N. Root knot nematode resistance in tomatoes. (pp. 150–51).*

The reactions of three tomato lines to five species of *Meloidogyne* have been tested. Queens was susceptible to all five species, while Hawaii 5229 and STEP234 (F_1 of Hawaii 5229 x Maui) were susceptible to *M. hapla* but resistant to *M. incognita*, *M. incognita* var. *acrita*, *M. arenaria* and *M. javanica*. Resistance to *M. incognita* has been found to be controlled by a dominant gene, simply inherited.

1359 *Dorman, K. W. Progress in the selection of superior strains of southern pine.* (*pp. 151–52*).

Wide differences have been found in the growth of wind-pollinated seedlings from different plus trees of *Pinus taeda*, *P. elliottii*, *P. echinata* and *P. palustris*, and also in reaction to *Cronartium fusiforme* in the case of *P. taeda* and *P. elliottii.* These results are taken to confirm the suggestion that these four species are genetically quite variable and that selection of superior types is possible.

1360 *Overcash, J. P. Raspberry breeding in Mississippi.* (*p. 167*).

A brief report is given of the progress of the raspberry breeding programme in Mississippi. Interspecific crosses have been made between *Rubus biflorus*, *R. coreanus*, *R. kuntzeanus* and *R. parvifolius*, all of which are Asiatic species which grow vigorously but produce poor fruit in North America, and varieties of *R. idaeus.* Many of the progeny resulting from these crosses and subsequent back crosses are vigorous, tolerant of high summer temperatures and drought and produce good quality fruit. (Cf. *PBA*, XXIV, Abst. 2431).

1361 *Williams, C. F. Size of fruit of pistillate and hermaphroditic seedlings in muscadine grape crossings.* (*p. 168*).

The average size of the fruit produced by female seedlings was found to be greater than that of fruit from hermaphrodite seedlings and in most cases the number and weight of seeds per fruit from female seedlings was less, although the individual seeds were larger than those produced by the hermaphrodite seedlings.

1362 *Showalter, R. K. & West, C. L. (Jun.). Size and quality of watermelon varieties in Florida.* (*p.* 168).

Data are provided on the weight, quality, ripening during storage and susceptibility to bruising of fruits of Congo, Canonball and Charleston Gray water melons.

1363 *Mohr, H. C. Mode of inheritance of the bush growth characteristic in watermelon.* (*p.* 174).

A single plant of Desert King was found in 1953 to exhibit a dwarf growth habit, which was also shown by its progeny. The F_1 progeny of a cross between this dwarf line and a normal line were normal but approximately one quarter of the F_2 progeny were dwarf, indicating that the dwarf habit is controlled by a recessive gene.

1364 *Hernandez, T. P., Miller, J. C., Mikell, J. J., Hernandez, T. P. & Fontenot, J. F. Mutations, a means of improving sweet potato varieties and seedlings.* (*p.* 175).

Data are provided on the numbers and types of skin mutations and sectorial mutations found in a study of Unit I Porto Rico, Goldrush and Earlyport begun in 1950.

1365 *Oberle, G. D. Breeding frost hardy peaches for Virginia.* (*p.* 183).

It has been found that frost resistance in peaches and nectarines is inherited, and a number of frost resistant seedlings are being propagated for selection for desirable fruit characters.

1366 **Annual Report of the Massachusetts Agricultural Experiment Station, 1954-1955.**
Bull. 1955 : No. 490 : Pp. 71.

Maize. Work in connexion with the production of flint-dent hybrids superior to Mass. 63 continued.

Cocksfoot. A new leafy, late-maturing strain is undergoing commercial trial.

Cranberry. Crosses were made to develop varieties lower in acid content and higher in sugar concentration.

Carrot. The new variety Waltham Hicolor, developed from a cross between a strain of Hutchinson and a long, thick, dark-red carrot from Turkey, gave good results on different types of soil.

Cabbage. The desired type of small second-early cabbage for the market gardener was unsatisfactory as a seed producer. Using bees as pollinators, selections with good seed production have been secured. Incorporation of club-root resistance in cabbage lines and the broccoli Waltham 29 is under way.

Lettuce. Progress is being made in breeding a strain of the Iceberg type improved in quality and adaptability.

Tomato. Waltham Mold Proof Forcing 2–22 (cf. Abst. 950) and 54, homogeneous for immunity from *Cladosporium* leaf mould, have been developed after crossing Waltham Mold Proof Forcing with lines possessing immunity derived from various sources. An attempt has been made to develop a crack-resistant trellis type as early as Trellis 22; late-maturing selections are highly resistant but only a very few of the early ones are less susceptible than Trellis 22. The F_1 hybrid Red Jet has shown promise.

Sweet corn. Synthetics are being developed as sources of new germ plasm.

1367 Smith, A. L. & McCain, F. S.
New cottons and corns are products of years of plant breeding.
Highlights agric. Res., Ala. 1955 : **2** : No. 1 : unpaginated.

A brief account is given of the progress made in breeding maize and cotton in Alabama up to the present time.

1368 **Agricultural research in Indiana. Sixty Eighth Annual Report of the Director of the Purdue University Agricultural Experiment Station, Lafayette, Indiana, for the year ending June 30, 1955.** Pp. 154.

In addition to the work reported below, varietal trials have been carried out with rye, cocksfoot and peaches.

Wheat. Promising soft winter-wheat lines have been developed by back crossing and by composite crossing, some of the latter group combining high yields with improved straw strength and disease resistance.

Foundation seed is being increased for release of four experimental lines of soft red winter wheat, all of which have outyielded test varieties in three-year trials. The lines are 414A9–2–3–23 (CI12748), 339A2–2–2–26 (CI112557), 40145A3–13–1–1–1 (CI113084) and 40149A4–9–3–5–113 (CI13083), of which the last named is adapted to a wide range of conditions.

Oats. The experimental variety 436A1–2–4–1 [Nemaha x (Clinton x [Boone x Cartier])] has been released to certified growers and several other lines from the same cross continue to do better than many commercial varieties. Other promising crosses include Clinton^2 x Arkansas 674, Clinton x (Boone x Cartier) and (Lee x Victoria) x Forkedeer^2 and the recently released Dubois (cf. *PBA*, XXIII, Abst. 1902).

Maize. Several leaf-blight resistant selections have been recovered from commercial inbred lines by outcrossing and back crossing. The progeny of these lines crossed with Wf9 x 0145 and M14 x Os420 showed considerable improvement over their parents in respect of yield and disease resistance. The most promising lines will undergo further selection and breeding.

A gene has been identified which more than doubles the percentage of amylose in maize endosperm and which in combination with su_1 produces a glassy, unwrinkled kernel which is thought to have unusual chemical properties.

Barley. The experimental winter barley lines 432A6–1–2–4 and 4027A1–4–3 have continued to do better than any of the commercial varieties now widely used in Indiana.

Poa. Nurseries have been established in cooperation with the Carnegie Institute of Washington (cf. Abst. 134) with a view to evaluating the forage and turf potentialities of hybrid lines and parental strains. All combinations with *P. pratensis* as the pollen parent have shown field survival approximately equal to that of *P. pratensis* while poorest survival was found with species from the western United States. Four of the hybrid lines, five *P. pratensis* strains and one commercial variety have shown promise as lawn grasses and are rust tolerant.

Lucerne. Selections from the first breeding cycle are now under nursery trial and a second cycle has been started.

Field studies have shown that the survival of specimens of *Philaenus leucophthalmus* on a resistant selection is less than half that on all other selections tested.

The mode of inheritance of viable pollen is being investigated in diploid lucerne, and in tetraploid lucerne the inheritance of a mutant gene causing a chlorotic condition and an elongated hypocotyl is under investigation. Disomic segregation appears to operate for over 90% of the characters studied, although cytological investigations suggest that tetrasomic segregation occurs.

Red clover. Selections have been made from plants in nursery tests for resistance to *Colletotrichum trifolii* and studies of the inheritance of resistance have continued. Varietal trials are briefly reported.

Apple. The chromosome numbers of root tips from scions of 2–2–4 chimeras of Grimes and Winesap were found to be either diploid or tetraploid and no cases were found of both $2n$ and $4n$ roots being produced by one scion. Three chimeras have been selected which are expected to be true breeding for the tetraploid condition, a 2–4–4 chimera of York Imperial and 2–4–4 and 4–4–4 chimeras from amongst scab resistant selections.

Breeding for resistance to *Venturia inaequalis* has continued, with selection of diploid and triploid seedlings from crosses involving eight sources of resistance.

Studies of genes controlling unusual virulence in *V. inaequalis* have led to the identification of the genes D, G and G_1 and R, in collections from South Dakota and Nova Scotia. These genes control full or modified virulence on Dolgo, Geneva and a Russian segregate respectively, all of which are resistant to *V. inaequalis* from Indiana, Europe and Australia.

Spinach. Studies of crosses between tetraploid and diploid spinach indicate that random segregation of the genes determining sex occurs. Tetraploid lines have been produced whose progeny segregate equally into male and female plants and it is expected that this 1 : 1 ratio will be maintained when these lines are crossed.

Water melon. It is thought that three of the selfed progeny of colchicine-treated Purdue Hawkesbury are tetraploids and they are to be used in the production of triploid seed with a view to developing a seedless strain. Several plants from colchicine-treated Early Bird, Early Northern Sweet, Klondike R–7, Early Canada, Sugar Baby and Peacock also exhibit morphlogical characters associated with polyploidy and are to undergo further testing and selection.

Tomato. In breeding for higher vitamin content, 28 strains with up to 20 times the normal β-carotene content and 16 with intermediate β-carotene content show good field characters but are of poor flavour. Several newer selections appear more promising. Some selections with approximately double the normal vitamin C content have been developed but are of poor quality. A new pigment type high in δ-carotene has been chemically analysed and genetical studies of this and seven other pigment types are being carried out.

Soya bean. Inheritance studies have shown that resistance to *Cercospora sojina* is controlled by a single dominant gene, *Cs*, in the varieties Lincoln, Wabash and Illini. Perry is intermediate in susceptibility but progeny from crosses between Perry and resistant or susceptible varieties segregate as if Perry were susceptible, suggesting the presence of modifying factors.

Varietal differences have been found in reaction to *Diaporthe phaseolorum* var. *caulivora.* Varietal trials have been carried out in which several new selections have shown promise, including selections from Lincoln x Ogden and from Mandarin crossed with Hawkeye, Mukden and Lincoln.

1369 **What's new in farm science. Annual report of the Wisconsin Agricultural Experiment Station.**
Pt. 1 : 1955 : Bull. No. 517 : Pp. 84;
Pt. 2 : 1956 : Bull. No. 524 : Pp. 84.

Wheat. Russell has outyielded Henry in eight-year trials, and in a five-year trial at five localities has outyielded Henry, Sturgeon, Lee, Thatcher and Mida. (Cf. *PBA*, XXVI, Abst. 3153).

Oats. Sauk has yielded well under Wisconsin conditions and Beedee and Fayette have been released for use in this state. (Cf. *PBA*, XXIII, Abst. 1904 and XXVI, Abst. 2144). Breeding for resistance to *Leptosphaeria avenaria* has continued.

Rye. Adams has continued to do well in Wisconsin, giving good yields and showing satisfactory resistance to cold and lodging.

Maize. Seven new three-way hybrids were released in 1955 and four three-way hybrids and two double hybrids in 1956. They are uniform, high yielding and resistant to stalk rot and lodging.

Some lines have been found to show greater injury after spraying with CMU than others.

Rust resistant plants from the Cuzco valley of Peru and from Ecuador are being used in the breeding programme and are resistant to all known races of *Puccinia sorghi.*

Barley. A new, stiff-strawed variety, Fox, has been released, and has proved resistant to *Puccinia graminis*, moderately resistant to *Ustilago* spp., *Helminthosporium sativum* and *H. teres* but susceptible to *Erysiphe graminis.*

Lucerne. When artificially inoculated with *Corynebacterium insidiosum*, Vernal showed 42% infected plants, Ranger 57%, Caliverde 67% and Buffalo 68%, while Rhizoma showed almost 100% infection. Vernal has consistently given higher yields than Ranger and Grimm both in the presence and absence of *C. insidiosum.* It persists better under grazing and appears less palatable to leaf hoppers than other varieties.

Red clover. Dollard, Pennscott, Kenland and Midland have given the best yields at five localities, although Pennscott and Kenland are susceptible to *Colletotrichum trifolii.*

Potato. Two new varieties have been released for use in Wisconsin: Antigo, which is white-skinned, medium early, of good quality and resistant to *Streptomyces scabies*, and Red Beauty, which has a red skin and white flesh, is early, resistant to *Verticillium* wilt, tolerant of purple top wilt but susceptible to *S. scabies.* (Cf. *PBA*, XXVI, Absts. 2592 and 2593).

A number of species and varieties from other countries are in use in the breeding programme and some selections have proved resistant to *Phytophthora infestans*, *Pseudomonas solanacearum*, *S. scabies* or *Verticillium albo-atrum.* Interspecific hybrids have been produced from crosses between species with $2n = 24$ and $2n = 48$ by the use of colchicine to double the chromosome number of these with $2n = 24$. It has been shown that resistance to *S. scabies* is associated with a gene causing russeting of the tubers.

Tobacco. Three lines have been developed which possess immunity to *Pseudomonas tabaci* combined with high resistance to *Thielaviopsis basicola* and mosaic.

Poplar. Selections are undergoing field trials with a view to breeding fast-growing, disease-resistant strains.

Cabbage. Two cabbage varieties resistant to *Fusarium oxysporum* f. *conglutinans* are to be released in Wisconsin. They are Badger Ballhead (Wisconsin Ballhead x Wisconsin Hollander), which has a small head and is resistant also to mosaic, and YR Charleston Wakefield [(Charleston Wakefield x Jersey Queen) x Charleston Wakefield], which is similar to Charleston Wakefield but possesses greater resistance to yellows. (Cf. *PBA*, XXVI, Abst. 2890).

Soya bean. Norchief, Chippewa and Grant have been released for Wisconsin, the two former being particularly recommended (cf. *PBA*, XXV, Abst. 2512 and XXVI, Absts. 1903 and 2941).

Pea. Alaska peas have shown greater injury after spraying with MCP than Perfection and an unnamed variety.

1370 **Your division of agriculture reports . . . . Report of the Division of Agriculture, Iowa State College, 1955-1956** : Pp. 76.

Trials have been carried out with maize, sweet potatoes, strawberries, musk melons, water melons and popcorn.

Oats. Identifications of isolates have shown that 40% of infection by *Puccinia coronata* in Iowa in 1954 was caused by race 202 and 23% by race 203. Landhafer, Santa Fe, Trispernia and Bondvic have remained free of infection. The reactions of seedlings to several races of *P. coronata* and *P. graminis* var. *avenae* have been investigated in greenhouse tests. Several lines from the world collection of oats were found to be resistant to race 6 of *P. graminis* var. *avenae.* In variety trials at nine localities Sauk gave the highest average yield. It has been found that high levels of application of nitrogenous fertilizers tend to increase the amount of tillering of some varieties.

Lucerne. Vernal has given the best average performance in all tests. Seven selections from Iowa have been submitted for regional testing throughout the Midwest region of America. Breeding for resistance to *Ascochyta imperfecta* and *Pseudopeziza medicaginis* has been initiated.

Clover. Kenland and Midland red clover have given the best forage yields in trials extending over five years, while a number of English varieties have proved poorly adapted to Iowa conditions and have not yielded well. Commercial certified Ladino clover and Pilgrim white clover have been outyielded by an Iowa synthetic variety which has also shown better survival in three-year-old stands. Breeding for resistance to *Phoma trifolii* is being started.

Birdsfoot trefoil. Viking, Cascade, Granger and Italian, all of which are erect-growing varieties, have proved superior in three-year trials to the prostrate varieties for hay production, but inferior for permanent pasture.

Soya bean. A line has been isolated which is resistant to *Diaporthe phaseolorum* var. *batatatis.*

1371 **Better agriculture through research in South Dakota 1887-1956.**
Circ. S. Dak. agric. Exp. Sta. 1956 : No. 123 : Pp. 63.

This circular gives a popular account of the work carried out at the South Dakota Agricultural Experimental Station since its foundation in 1887 and includes notes on the breeding of trees and crop plants, the introduction of new crops and new varieties and investigations of disease-control methods.

1372 **Field days at Main Station, Rocky Ford. New bean variety seen. Sorghum trials shown.**
Colo. Fm. Home Res. 1956 : **7** : No. 2 : p. 10.

Mention is made of Pinto 1540, a bean resistant to rust and mosaic, which may be shortly named and released. The high yields obtained from hybrid sorghums are also referred to.

1373 **Cotton, alfalfa topics at New Mexico Farm Day.**
Sth. Seedsman 1956 : **19** : No. 11 : p. 70.

A new variety of lucerne possessing resistance to the spotted aphid has been released in New Mexico. Named New Mexico 16, its parentage includes Lahontan, New Mexico Common and Hardistan.

Three strains of cotton, Acala 1014, 1028 and 1136, are undergoing advanced tests with a view to replacing Acala 1517C. The two former are stronger and produce higher quality thread than Acala 1517C. Other trials are also reported.

1374 Godoy, E. F.
La experimentación agrícola en algunos centros de Latinoamérica. **(Agricultural experimentation in some centres in Latin America).**
Idia 1956 : No. 102 : 18–22.

Reference is made to the Third International Conference on Wheat Rusts held in Mexico on

18–24 March 1956, where a great part of the discussion centred round the production of wheats resistant to race 15B, in which connexion the importance of the back-cross method is mentioned. The use of composite varieties, initiated in Mexico by Borlaug, has been adopted also in Colombia.

An outline is given of the activities of the agricultural experiment stations at Tibaytatá in Colombia and La Molina in Peru and of the Ministry of Agriculture in Chile.

1375 **Notes on current investigations (research), October to December, 1955.**
Malay. agric. J. 1956 : **39** : 63–70.

Rice. Hybrids between *indica* and *japonica* are showing wide segregation in the F_2 progeny. Engkatek has proved highly resistant to lodging even under heavy manuring.

Oil palm. Results indicate that the progenies of palms 12/3 and 1/1 are the earliest in bearing, and 1/7 and 14/2 have the largest bunches of the back-crossed dumpy palms.

Pineapple. Sarawak and Smooth Cayenne have a higher sugar content than Singapore Spanish but the extent of the difference varies with different manurial treatments. Sarawak has been found to be resistant to fruit collapse, while Singapore Spanish, Selangor Green and Mauritius are all equally susceptible.

1376 van Heusden, W. C.
Het proefstation der C.P.V. in 1955. **(The experimental station of the Central Association of Experimental Stations in 1955).**
Bergcultures 1956 : **25** : 331–51.

The results of research on rubber (cf. *PBA*, XXVI, Absts. 1650–52 and 3656–58), tea (cf. *PBA*, XXVI, Absts. 2690–92), coffee (cf. *PBA*, XXVI, Absts. 2693 and 3599) and cacao (cf. *PBA*, XXVI, Absts. 2699–2700) at the Bogor Central Experimental Station, Java, during 1955 are summarized.

1377 **Annual Report of the Director-General of Agriculture of the Department of Agriculture, New Zealand, for the year ended 31 March 1956 :**
Pp. 178.

Varietal trials have been carried out with tobacco, plums, peaches, black currants, grapes and lettuce.

Gooseberry. Sixty-four varieties and strains are now under observation at Levin and a very early line selected from Farmer's Glory is particularly promising.

Pole bean. Westralia has shown superior resistance to *Uromyces appendiculatus.*

1378 **Thirtieth Annual Report of the Department of Scientific and Industrial Research, New Zealand. 1956 :**
Pp. 73.

Included in the section entitled Research are the following items of interest to plant breeders:—

Wheat. The new variety Arawa (cf. *PBA*, XXVI, Abst. 1084) has proved satisfactory, and has given yields equal to Dreadnought under dry conditions.

Potato. Complete immunity to all strains of viruses X and Y has been successfully transmitted to a number of hybrid progeny.

Tobacco. Two lines combining high yield with resistance to *Thielaviopsis basicola* are being increased and lines combining mosaic resistance with resistance to *Th. basicola* are undergoing field trials.

Hop. Breeding for resistance to *Phytophthora* root rot has continued, and a few plants are promising in this respect, in addition to giving high yields of good quality cones.

1379 **Annual Review of the Canterbury Agricultural College, Lincoln, New Zealand, for the year ending 30th June, 1956.** Pp. 97.

Lucerne. Trials have been set up to determine (1) the productivity and growth of ten varieties of lucerne used for hay, (2) the survival and productivity of five varieties of *Medicago sativa* and five of *M. media* under conditions of intensive grazing and (3) any interaction between strain and method and rate of sowing. Selection for productivity, earliness and presence of rhizomes has continued and hand crosses and polycrosses made between selected plants.

Proceedings of the Pan Indian Ocean Science Congress. Sections B and D. Biological and Agricultural Sciences.
Perth, W. Australia 1954 : Pt. I : Pp. 83; Pt. II : Pp. 64.

Part I.

A. Proceedings of Section Meetings.

1380 *Plant genetics.* (*pp.* 6–7).

Suggestions for obtaining several generations of plants in one year, thus reducing the time required to complete a breeding programme, were made by A. J. Millington. W. Poggendorf discussed the progress made in breeding rice in New South Wales. Contributions by O. H. Frankel and J. S. Gladstones are printed in full elsewhere and are summarized below.

1381 *Fundamental research in cereal rusts.* (*pp. 8–9*).

E. P. Baker and Y. M. Upadhyaya described studies of the races of *Puccinia graminis* var. *avenae* and *P. coronata* var. *avenae* in Australia. In each case one to three dominant genes for resistance have been found. Contributions by I. A. Watson and D. S. Athwal, A. T. Pugsley, B. P. Pal and J. Reeves are printed in full elsewhere and are summarized below.

B. Sectional Papers

1382 *Camara, A. The distribution of plants and animals. Regions of genetical interest.* (*pp. 23–27*).

Among the topics discussed in this general article is the suggestion that Genetical Reserves should be established to protect zones of genetical interest, that is, centres of origin and centres of variation, in order to preserve sources of genes for breeding purposes.

1383 *Joshi, A. B. Application of genetics to plant breeding in India.* (*pp. 68–71*).

This contribution gives a general review of the application of genetics to the breeding of crop plants in India, with particular reference to improvement by selection and intervarietal hybridization, breeding for disease resistance, distant hybridization, polyploidy, hybrid vigour and mutation.

1384 *Frankel, O. H. Genetic adaptation of cultivated plants in Australia.* (*pp. 71–74*).

The author suggests that the reason why the native flora of Australia has made only a small contribution to the genetical constitution of introduced crop plants is probably its evolutionary isolation. Since the native flora has not been utilized by man to any extent most of the cultivated plants are introductions which have been improved by adaptation and natural selection under Australian conditions as well as by breeding. The development of wheat, potatoes and a number of vegetables in Australia is discussed in detail to illustrate this suggestion.

1385 *Buzacott, J. H. A review of sugar cane breeding in Australia.* (*pp. 74–79*).

The history of sugar-cane breeding in Australia is reviewed, particular reference being made to improvements in technique, genetical work, resistance to pests and diseases and sources of parental material. Varieties bred in Australia now form more than 77% of the total crop grown.

1386 *Gladstones, J. S. An investigation into the cytology, taxonomy and breeding of lupins* (Lupinus *spp.*). (*pp. 80–81*).

The chromosome numbers of species of lupin naturalized in Western Australia have been determined as *L. varius* (probably = *L. cosentini*) $2n = 32$, *L. angustifolius* $2n = 40$, *L. hirsutus* (probably = *L. pilosus*) $2n = 42$, *L. albus* $2n = 50$ and *L. luteus* $2n = 52$.

1387 *Simplicio Duarte, A. & Mello-Sampayo, T. The improvement of rice in Portugal and the importance of the introduction of exotic forms.* (*pp. 81–82*).

Data are provided on the number of days to flowering and to maturity, height, numbers of culms and spikelets, percentage of empty spikelets, weight of 100 grains and total weight of spikelets of Vary Lava 051 A from Madagascar and Colusa 180, Precoce y5239 [Early y5239], Premont y5376 and Seln 244 AG20 from Australia, when grown at Sacavem in Portugal. All were resistant to lodging and are among the most satisfactory of the 157 introduced varieties so far tested. Seventeen varieties from Madagascar and two from India have proved resistant to *Piricularia oryzae*. The genetical control of resistance is being investigated.

Part II

1388 *d'Oliveira, A. B. Fundamental research on cereal rusts.* (*pp. 1–7*).

The author suggests lines along which fundamental research on rusts might be carried out, including (1) rust physiology, (2) host-rust relations, (3) rust specialization and stability of physiological races and (4) hosts for the gametophytic stages of cereal rusts. Reference is briefly made to work already carried out in these fields.

1389 *Pugsley, A. T. Backcrossing for disease resistance in cereals.* (*pp. 7–10*).

The progress made in the development of disease-resistant cereal varieties in Australia by the use of the back-cross technique is reviewed, particular reference being made to stem and leaf rust and bunt of wheat and mildew and covered smut of barley. (Cf. *PBA*, XX, Abst. 241 and XXIV, Abst. 1867).

1390 *Pal, B. P. The improvement of wheat in India.* (*pp. 11–13*).

The author briefly surveys wheat breeding in India since 1900, and suggests the most useful lines to be followed in the future, namely breeding for resistance to disease, particularly rusts, and breeding for special conditions of soil and climate.

1391 *Chavan, V. M. Breeding of rust resistant wheats in Bombay (India).* (*pp. 13–15*).

Promising selections resistant to *Puccinia graminis* var. *tritici* have been developed in Bombay state, using as parents the varieties

Kenya–E 144, Hofed–1, Gaza and others, but in some cases they have proved susceptible to *Alternaria* sp. when grown under irrigation with heavy manuring.

1392 *Watson, I. A. & Athwal, D. S. Australian studies on wheat rust. (pp. 15–18).*

In the first part of this paper the authors summarize the present situation with regard to the variability of *Puccinia triticina* and *P. graminis* var. *tritici* in Australia. In the second part they discuss the information derived from genetical studies as to (1) the sources of genes providing resistance to the prevalent rust races and (2) the mode of inheritance of resistance. (Cf. *PBA*, XXII, Abst. 1891, XXIV, Abst. 1793 and XXV, Abst. 945).

1393 *Reeves, J. A note on breeding for rust resistance in Western Australia. (pp. 18–19).*

The technique used at the Merredin Research Station to create artificial epidemics of *Puccinia graminis* var. *tritici* is described. Two varieties developed at this station for use in Western Australia have so far been released: Dowerin, resistant to all stem-rust races and Wongoondy, resistant to all except 126B.

1394 **Seventh Annual Report of the Commonwealth Scientific and Industrial Research Organization of the Parliament of the Commonwealth of Australia for the year ending 30th June 1955** : Pp. 185.

Developmental genetics. Several mutants have been obtained in *Arabidopsis thaliana* by X-ray treatment, including one incapable of synthesizing thiamine, one in which flower initiation and development are particularly temperature sensitive and one in which the growth rate is significantly higher than in untreated plants.

Wheat. The inheritance of factors for basal sterility in speltoid mutants from three commercial varieties is being studied. In two mutants, St_1 and St_{1a}, the basal flower does not develop a grain, and may be imperfectly developed or absent, while in the third, St_2, the lowest two flowers are sterile. F_2 and F_3 progeny have been produced from crosses between the mutants themselves, and between the mutants and their parent varieties and other commercial varieties. The expression of basal sterility has been found to be closely linked with that of speltoidy.

Pasture plants. Only triploid progeny have so far been produced from crosses between *Hordeum bulbosum* and awnless types of *H. vulgare.* Since these are expected to be sterile, the chromosome number of the *H. vulgare* strains is being doubled, with the aim of producing fertile tetraploid progeny. Unusual meiotic behaviour of univalents has been found in the progeny of *Phalaris coerulescens* x *Ph. minor* and *Ph. tuberosa* x *Ph. minor* and a new incompatibility system has been found in *Ph. coerulescens* (cf. Abst. 1875). The chromosome numbers so far determined for the genus *Danthonia* have been found to fall into a polyploid series ranging from $2n = 24$ to $2n = 120$. A few hybrid plants have been found, although the genus is normally cleistogamous.

An intensive hybridization and natural selection programme is in progress with *Medicago*, using principally *M. sativa* and *M. falcata*, and preliminary results indicate that rapid selection for adaptability to shorter day length is possible. The inheritance of burr structure and hard seededness in the annual species of *Medicago* is being investigated. White-clover populations from different parts of Europe have shown differences in self compatibility. Gene frequencies for the production of white leaf-markings are correlated with those for the production of lotaustralin and linamarase. The presence of subspecies in subterranean clover is indicated by reproductive and vegetative anomalies, including pollen sterility, embryo abortion and the segregation of dwarf and semidwarf plants, in the progeny of some crosses. These abnormalities appear to be independently determined; in the case of sterility the main cause is thought to be genic. Differences have been found between varieties in their photoperiodic and temperature requirements for flowering and in the speed of germination of soaked and refrigerated seeds. A breeding programme has been begun with the aim of developing strains of *Indigofera endecaphylla* free from β-nitropropionic acid.

The mode of pollination has now been determined in some of the subtropical legumes under investigation. *Phaseolus lathyroides* is self-pollinated, pollination occurring when the buds are relatively small, while in *Desmodium unciniatum* and *I. endecaphylla* tripping takes place, so that both self and cross pollination can take place. A high percentage of humidity, ca. 90%, is required for pollination and seed setting in most of the subtropical legumes.

Potato. The release of a water-soluble fungicidal factor has been demonstrated in potato tubers interacting parabiotically with the pathogen, and a substance has been extracted from such tubers which checks the dehiscence of the sporangia and the germination of the zoospores of *Phytophthora*.

Tobacco. Breeding for resistance to mosaic, yellow-dwarf virus and *Peronospora tabacina* has continued, making use of interspecific hybridization. The Ambalema type of resistance to mosaic has been incorporated into lines suitable for growing in areas where high temperatures occur during the growing season. It has been shown that several genes are involved in the inheritance of unpalatability to looper caterpillars.

Oil crops. Varietal trials have been carried out with safflower and linseed at various localities in Australia. Breeding of safflower for yield, oil content, rapid early growth and spinelessness has continued, and it has been found that resistance to *Puccinia carthami* is dominant and monogenically controlled. Studies of linseed selections from Punjab x Walsh have been made and some have been found superior to Walsh in yield and oil content and to Punjab in oil quality and resistance to the Australian races A and B of *Melampsora lini*.

Stone fruits. Varietal differences in susceptibility of the fruits of cherries, plums and nectarines to *Sclerotinia fruticola* have been found which are thought to be due to properties of the epidermis.

1395 **Annual Report of the Department of Agriculture and Stock, Queensland, for the year 1955-56** (1956) : Pp. 126.

Wheat. A new race of stem rust may have arisen since several hitherto-resistant varieties were attacked, Celebration, in particular, showing for the first time a considerable amount of infection. By back crossing, genes for resistance to stem rust, leaf rust and mildew have been incorporated in the variety Puora.

Oats. Breeding to develop a series of new crown-rust resistant varieties is being intensified, as a precaution against the probable breakdown of the resistance of Bovah and Benton when new races occur.

Maize. The use of hybrids is now firmly established in all maize-growing districts except the Atherton Tableland.

Sorghum and Sudan grass. Hybrid selections are under test at the Biloela Regional Experiment Station.

Fruits. A new mandarin variety, not yet named, is to be released as a substitute for Emperor in districts where brown spot is troublesome.

The papaya Hybrid 5, bred at Nambour, is to undergo seed production.

In work on passion fruit, crosses are being tested for resistance to *Fusarium* and other characters.

Macadamia. Selections of the rough-shelled and smooth-shelled types have been obtained.

Tomato. Nematode-resistant strains have been developed, but they are pale-skinned at the green stage and are thus at a commercial disadvantage. Introduced varieties and lines resistant to *Fusarium* wilt have been used as sources of resistance in crosses with susceptible commercial varieties.

Bean. Differences have been noted in the cold tolerance of strains of the French bean Brown Beauty; it may be possible to use different strains of this variety for the production of the autumn, winter and spring crops respectively in the coastal region of southern Queensland. Progress has been made in incorporating resistance to rust and angular leaf spot in Brown Beauty; promising material is also being screened for resistance to mosaic and anthracnose in the hope of securing lines resistant to all four diseases.

Cowpea. Several introductions have proved to be resistant to *Phytophthora* stem rot. CPI 11044, the best agronomic type, is to be released.

1396 **F.A.O.'s interest in atomic energy.**
Agriculture, Pakistan 1956 : **7** : 169–86.

Some of the recent developments and future prospects of the use of radioactive isotopes and other sources of radiation in plant breeding are briefly discussed.

1397 Becker, G.
Problematik der Qualitätszüchtung. (**Problems in breeding for quality**).
Landw. Forsch. 1956 : 8. Sonderheft : 25–42.

A general account of current aims in breeding for improved quality in crop plants is given, special emphasis being laid upon laboratory methods of testing the biochemical composition of individual plants. Among the principal difficulties encountered in breeding for quality are increased susceptibility to insect pests and diseases and the complex mode of inheritance of some of the characters determining quality.

Montalenti, G. & Chiarugi, A. (Editors).
Atti del IX Congresso Internazionale di Genetica, Bellagio (Como), 24–31 Agosto 1953. Parte II. [**Proceedings of the 9th International Congress of Genetics, Bellagio (Como), 24-31 August 1953. Part II**].
Caryologia 1954 : **6** : Suppl. : 621–1331.

Summaries of papers included in Part I appeared in *PBA*, XXVI, Absts. 9–30. Of the contributions in Part II, the following are of most interest to plant breeders and geneticists:—

1398 *Lima-de-Faria, A. Structure and properties of the kinetochore.* (*p. 649*).

Instead of two pairs of chromomeres separated by a pair of deeply stained fibrillae, as previously reported (cf. *PBA*, XXV, Abst. 1941), three chromomere pairs have been distinguished as components of the centromere of the pachytene chromosome in some plants of rye. In *Agapanthus umbellatus* the two longitudinal halves of the centromere have been observed to be individualized and separated from each other after prometaphase II. The author expresses the view that the region binding together the two sister chromatids of each chromosome until the beginning of anaphase II is the proximal part of the arms and not the centromere, as previously supposed.

1399 *Lima-de-Faria, A. & Bose, S. Comparative analysis of aceto-carmine solutions.* (*pp. 652–53*).

Cf. *PBA*, XXV, Abst. 700.

1401 *Angulo, M. D. Chromosomic variations induced by ultrasonic irradiation in meiosis of* Allium cepa. (*pp. 696–97*).

Ultrasonic treatment of the inflorescences resulted in several irregularities, such as fragmentation, anaphase bridges, impairment of the spindle mechanism, and agglutination and disintegration of the chromatin. Pollen mother cells from inflorescences of treated bulbs showed similar anomalies.

1402 *Mac Key, J. Mutability at diploid and polyploid level.* (*pp. 697–98*).

The author summarizes the conclusions he has reached concerning mutability induced in diploid barley and hexaploid wheat by X-ray and neutron treatment (cf. *PBA*, XXIV, Abst. 1838).

1403 *Novick, A. & Szilard, L. Anti-mutagens.* (*p. 698*).

Relatively small concentrations of adenosine, guanosine or inosine completely suppressed the induction of phage-resistant mutants in *Escherichia coli* by theophylline or caffeine. These nucleosides reduced the rate of spontaneous mutation to about one-third of its value in untreated bacteria but did not alter the mutagenic effects of ultraviolet and X radiation.

1404 *Antunes Filho, H. & Carvalho, A. Genetics of* Coffea: *XVI.* Typica *variety as standard for genetics of* C. arabica *L.* (*pp. 698–99*).

It is suggested that var. *typica* should be adopted as the standard type in genetical work. The following examples are given of epistatic relationships: *na* in type *nana* is epistatic to *t* in var. *bourbon*, *C* in type *calycanthema* to *sd* in type *goiaba*, and *pr* in var. *purpurascens* to *br* for green colour of the leaves when young; *mo* in var. *mokka* is partially epistatic to *lr* in var. *laurina*.

1405 *Krug, C. A., Carvalho, A. & Antunes Filho, H. Genetics of* Coffea: *XVII. Inheritance of the* angustifolia *characteristics in* C. arabica *L.* (*p. 699*).

Cf. *PBA*, XXVI, Abst. 2695.

1406 *Kehr, A. E. Genetic tumors in* Nicotiana *hybrids.* (*pp.* 699–703).

Further evidence has been obtained in support of the author's hypothesis that the tumours formed by certain interspecific hybrids of *Nicotiana* owe their origin to metabolic disturbances (cf. *PBA*, XXVI, Abst. 981). In experiments on *N. glauca* x *N. langsdorffii*, "normal" callus tissue originating from a plant which had not yet produced tumours was similar in its growth *in vivo* upon *N. glauca* and *in vitro* to tissue isolated from tumours subsequently developed by the same plant. Small segments of tissue from various parts of the plant were thus found to be autonomous with respect to tumour formation. *In vitro* cultures of tumour tissue frequently developed callus tissue producing normal stems and leaves but in the case of *in vivo* cultures no appreciable amount of differentiated growth took place. Tumour callus maintained its rapid growth in a hormone-containing medium but in the absence of hormone grew at the same rate as nontumourous tissue. Compared with either parent, *N. glauca* x *N. langsdorffii* not only contains more free auxin but is more efficient in converting tryptophane into auxin and contains more free tryptophane before conversion.

1407 *Nordenskiöld, H. Genetical study in the mode of segregation in hexaploid* Phleum pratense. (*pp. 704–07*).

Cf. *PBA*, XXIV, Abst. 369.

1408 *Larson, R. I. Assignment of chromosomes of common wheat to the A and B genomes on the basis of their effect on stem solidity.* (*pp. 707–09*).

With reference to the literature and her own investigations, the author discusses the suggestions she has made concerning the genome assignments of the chromosomes involved in the inheritance of stem solidity in *Triticum vulgare* (cf. *PBA*, XXIII, Abst. 1066).

1409 *Zanone, L. & Fabbretti, C. M. Variabilità di alcuni caratteri istologici del culmo di frumento. (Variability of some histological characters of the wheat culm). (p. 709).*

Variation caused by environmental factors on such characters as diameter, area of sclerenchyma and number or area of vascular bundles was often greater than differences between varieties.

1410 *Mazoti, L. B., Rossi, J. C. & Sosa, H. A. Estudios sobre el origen natural de variaciones heredables en maíz. (Studies on the natural origin of hereditary variations in maize). (pp. 709–15).*

Cf. *PBA*, XXV, Abst. 3025.

1411 *Tavčar, A. Heritable proliferation of tassels, a viviparism in* Zea Mays *L. and its cytological basis. (pp. 715–17).*

Cf. *PBA*, XXVI, Abst. 2311.

1412 *Glavinić, R. Hybrides végétatifs obtenus par le greffage des espèces différentes du cotonnier. (Vegetative hybrids obtained by grafting different species of cotton). (pp. 717–18).*

The species employed in these experiments were *Gossypium herbaceum*, *G. hirsutum* and *G. barbadense* and F_1 generations were obtained in which some plants resembled the species used as the rootstock and the others the parent used as the scion; in addition, several new characters, such as small cream-coloured flowers with a red spot at the base of the corolla and completely round capsules were observed in the vegetative hybrids. Seed obtained from a *G. barbadense* scion grafted on to *G. herbaceum* gave rise to 11 plants, 7 of which resembled *G. barbadense* and 4 *G. herbaceum.*

1413 *Iwar, B. Über Weizenbau und Weizenzüchtung in Südbrasilien. (On wheat cultivation and breeding in southern Brazil). (pp. 724–31).*

Work on wheat breeding at experimental stations in the state of Rio Grande do Sul during the past 30 years is summarized. Among well-known varieties that have been developed at the Bagé station, on the Uruguay border, are Fronteira [Frontier], Surpresa [Surprise], Frontana, Rio Negro, Bagé, Colônias and Trintani (cf. *PBA*, XXIII, Abst. 1843). Frontana, Bagé, Colônias and Trintani are recommended for general cultivation in southern Brazil.

1414 *Bonvicini, M. Varietà ramificate di* Triticum vulgare *nei lavori di miglioramento genetico. (Branched varieties of* T. vulgare *in plant breeding work). (pp. 731–38).*

Branched ears have been observed in a number of varieties of *T. vulgare* when they are grown under conditions of high fertility. Branched varieties of *T. turgidum* are too late in maturity for growing in Italy, as are most of the hybrids produced by crossing them with *T. vulgare*; in crosses with *T. durum* one line that seems to be genetically stable presents all the characters of a branched *T. durum.* Some branched wheats that have segregated from certain crosses between varieties of *T. vulgare* are thought to be of possible interest for agriculture or for further crossing, since they have short, strong straw and relatively early maturity.

1415 *Bonvicini, M. Indirizzi della genetica agraria per la resistenza all'allettamento in* Triticum vulgare. *(Directing agricultural genetics towards lodging resistance in* T. vulgare*). (pp. 738–43).*

The wheat varieties released by the Bologna plant breeding institute in Italy have been progressively shorter in the straw; thus Funo is only 102 cm. high, as compared with the old-fashioned Rieti 11 Todaro which was 167 cm.; some of the most recent hybrids are only 40 cm. high but possess large ears with high fertility and so unite good yielding ability with almost complete freedom from lodging, combined in some cases with satisfactory resistance to rusts.

1416 *Boyes, J. W. & Walker, G. W. R. Causes of sterility in* Triticum-Agropyron *amphiploids. (pp. 744–47).*

In investigations on F_5 amphidiploids of *T. dicoccum* 'Vernal Emmer' x *A. intermedium*, *T. turgidum* x *A. intermedium* and *T. vulgare* 'Kharkov' x *A. intermedium*, the following abnormalities were found to be the causes of partial sterility, in order of decreasing importance: (1) failure of the various stages of the fertilization process, (2) failure in embryo-sac development and (3) abortion due to abnormal development of the endosperm and embryo.

1417 *Sanchez-Monge, E. & Tjio, J. H. Note on 42 chromosome* Triticale. *(p. 748).*

Cf. Abst. 391.

1418 *Nybom, N. Karyotype and viability in barley. (pp. 748–50).*

These investigations on the yielding ability of lines homozygous for reciprocal translocations induced by X irradiation of a single pure mother line have been described in another paper (cf. *PBA*, XXV, Abst. 164).

1419 *Cameron, J. W. & Teas, H. J. Carbohydrate relationships in developing endosperms of brittle–1, brittle–2, and related maize genotypes.* (*pp. 822–23*).

During the late developmental period of the endosperm, bt_1 and bt_2 cause the production of higher amounts of reducing sugars and sucrose and a lower amount of starch than are found in the endosperm of the normal genotype. Water-soluble polysaccharide (WSP) does not accumulate at any stage in endosperm containing bt_1 or bt_2. In the homozygous double recessive genotype for su_1 and bt_1, bt_1 interacts additively with su_1 with respect to reduction in endosperm weight and starch content and possibly in increasing sucrose content but is epistatic to su_1 with respect to accumulation of WSP.

1420 *Lattin, G. de. Zur Vererbung der Anthocyanbildung bei* Vitis. (*On the inheritance of anthocyanin formation in* Vitis). (*pp. 823–27*).

Anthocyanin formation in the leaves and skin of the grape is controlled by two dominant genes in varieties of *V. vinifera* used for making red wine and by three dominant genes, two of which are identical with those found in *V. vinifera*, in *V. riparia*. These genes are not allelomorphic to each other. The *R* gene in the cultivated grape (cf. *PBA*, XXI, Abst. 1364) controls sugar metabolism in addition to anthocyanin formation and is lethal in the homozygous condition, possibly owing to interference with sugar metabolism.

1421 *Manunta, C. La fisiogenetica del colore dei frutti nel pomodoro* (Solanum lycopersicum). [*Physiogenetics of fruit colour in the tomato* (S. lycopersicum)]. (*pp. 827–30*).

The gene *R* conditions lycopene pigmentation in the flesh and *Y* conditions skin colour due to some substance of an anthoxanthin nature; high temperatures inhibit the formation of lycopene but not of β carotene, which seems to be conditioned by a gene *B*. In crosses between *L. hirsutum*, containing both *R* and *B*, and *L. esculentum* 'Palla Oro' [Golden Ball] containing neither, all possible combinations of the two pigments occurred in the F_3 and F_4 generations; some of the segregates also had high contents of vitamin C and provitamin A.

Further crosses have shown that tangerine forms are double recessive for the gene *t*, which results in the transformation of lycopene into prolycopene, and that *T* and *R* are independent genes. The synthesis of prolycopene is not inhibited by high temperature. It is suggested that lycopene, prolycopene and β carotene have a common precursor in their synthesis.

1422 *Davis, B. D. The mechanism of phenylalanine accumulation by a phenylalanine auxotroph of* E. coli; *a nongenetic autocatalytic system.* (*p. 830*).

The behaviour shown by the above autocatalytic mutant under certain conditions has already been described (cf. *PBA*, XXIV, Abst. 858).

1423 *D'Amato, F. A survey of acridines for chromosome-breaking (mutagenic) action in* Allium. (*pp. 831–35*).

The results of tests of the cytological effects of 54 acridine derivatives are summarized (cf. *PBA*, XXVI, Abst. 840).

1424 *Ford, C. E. Further studies of chromosome breakage by nitrogen mustard and by X-rays in broad bean* (Vicia faba) *root tips.* (*p. 835*).

Unreported investigations by the author suggest that chromosome breakage by nitrogen mustard may be confined to a restricted sensitive period at a relatively late stage in mitosis. This hypothesis and the cell-to-cell variation known to occur in rate of mitosis lead to the prediction that when the interval between treatment and fixation is relatively short metaphase cells with no structural change would consist of two classes: (1) those past the sensitive period at the time of treatment and (2) those at or before the sensitive stage at the time of treatment but by chance exhibiting no observable effect. The observed number of metaphases without structural changes would in this case be in excess of the Poisson expectation. An analysis of data from an experiment involving a series of treatment-fixation intervals were in agreement with this prediction. The results of a comparable analysis of data from an X-ray experiment were however consistent with the hypothesis that all stages of mitosis are sensitive to chromosome breakage by this type of radiation.

1425 *Giles, N. H. Spontaneous and induced reversions in biochemical mutants of* Neurospora crassa. (*p. 835*).

Fourteen inositolless mutants proved to be isoallelic, differing only in their spontaneous and ultraviolet-induced reverse mutability; a similar isoallelic situation was also demonstrated in the case of the locus determining five purple adenineless mutants (cf. *PBA*, XXIV, Abst. 1676). X-ray treatment of inositolless mutant 89601 induced both complete and partial reverse mutants; the latter behaved as intermediate allelic types. The reverse mutants were normal in crossing behaviour and linkage relationships, compared with 89601 and the wild type; X rays are therefore capable of inducing dominant changes which may be regarded as point mutations.

1426 *Kupka, E. Zur Theorie der Pyronineffekte. (On the theory of the effects of pyronin). (p. 836).*

The experiments were carried out on root-tip cells of *Allium cepa* and on epidermal cells of *Triton alpestris*. In general, pyronin had the same effect as X rays or mustard gas, weak concentrations causing chromosome breaks and chromosome bridges at anaphase and stronger concentrations a complete inhibition of the mitotic process. These effects are attributed to chemical changes brought about in the nucleic acid of the cell by pyronin.

1427 *Oláh, L. v. A new cytological effect by a saponin. (pp. 836–38).*

Treatment of root tips of *Allium cepa* and *A. sativum* with digitonin for 9–120 hours resulted in many irregularities, such as inhibition of the spindle function, multinucleate cells, abnormally-shaped chromosomes, stickiness, fragmentation and transformation of the entire meristematic zone into tissue containing polyploid and aneuploid nuclei. Nuclei with subhaploid chromosome numbers sometimes underwent synchronized mitotic division. With treatments of 20–40 hours, a nonfibrillar spindle-like substance appeared, followed by complete or incomplete cell-wall formation and unbalanced separation of the chromosomes.

1428 *Östergren, G. & Wakonig, T. A sensitive period at the chromosome breaking activity of coumarin. (pp. 838–39).*

Coumarin induced breakage in root tips of *Allium cepa* only in dividing nuclei; pseudo-chiasmata formed during mitotic divisions taking place during treatment are interpreted as chromatid interchanges in matrix-covered chromosomes (cf. *PBA*, XXV, Abst. 694).

1429 *Rosen, G. von. Radiomimetic activity and the periodical system of the elements. (pp. 839–40).*

Cf. *PBA*, XXIV, Abst. 1623.

1430 *Bateman, A. J. Self-incompatibility in the Cruciferae. (p. 840).*

Having found that in *Iberis amara* self incompatibility is due to a sporophytically-controlled reaction in both the pollen and style (cf. *PBA*, XXV, Abst. 1534), the author critically re-examines some of the literature on self incompatibility in *Brassica oleracea*, *Cardamine pratensis* and *Capsella grandiflora*.

1431 *Blakeslee, A. F., Satina, S. & Rietsema, J. Further studies in incompatible crosses in* Datura. *(p. 841).*

Ovular tumours are associated with embryo abortion in incompatible interspecific crosses of *Datura*. Extracts of such tumours contain auxins which inhibit the growth of normal embryos *in vitro*. Abortion *in vivo* is probably the result of endosperm degeneration. In culturing embryos on artificial media, the optimum sucrose concentration proved to be 1% for large embryos and 8% for small embryos. Within a single species, crosses between 4*n* and 2*n* plants were partially sterile and also developed ovular tumours; some exceptions were found to the general rule that crosses in which the tetraploid constituted the ♀ parent were the most successful.

1432 *Nygren, A. Studies in the inheritance of apomixis in the genus* Poa. *(pp. 842–43).*

All apomictic species of *Poa* contain strains with sexual tendencies. The possible reproductive behaviour of progeny obtained from interspecific crosses in which at least one parent is aposporous is described. In the later generations of the same cross, the apomictic system may be broken down to varying degrees in some plants but maintained in others. Apospory evidently depends upon a large number of genes. Attention is drawn to the ability of *P. pratensis* to hybridize freely with other species under natural conditions and to the consequent evolutionary significance of the semiapomictic mode of reproduction of this species.

1433 *Olah, L. v. Eine neue artifizielle* Digitalis-*Art:* Digitalis santacatalinensis. *(A new synthetic species of* Digitalis, D. santacatalinensis). *(pp. 843–44).*

Fertile allotetraploid hybrids between *D. lanata* and *D. lutea* were obtained by treating the F_1 progenies of crosses in both directions with a colchicine solution. Morphologically the hybrids resembled the *D. lutea* parent. Meiosis was regular in the pollen mother cells and cytological studies showed that the hybrids possessed the full chromosome complements of both parental species.

1434 *Rudorf, W. Neue Beobachtungen an Bastarden von* Phaseolus vulgaris *L. x* Phaseolus multiflorus *Lam. und* Ph. multiflorus *x* Ph. vulgaris. (*New observations on hybrids of* Ph. vulgaris *L. x* Ph. multiflorus *Lam. and* Ph. multiflorus *x* Ph. vulgaris). (*pp. 844–45*).

The cross *Ph. vulgaris* x *Ph. multiflorus* had a seed set of 42·3% but the reciprocal only 0·48%. A number of the F_1 of both crosses displayed a wide range of anomalies affecting plant growth and development, including chlorophyll deficiencies. The reciprocal differences in seed set are attributed to the action of genes for embryo lethality in the *Ph. multiflorus* parent and may also be due to cytoplasmic influences. The occurrence of stunted plants is thought to be due to the interaction of sublethal genes from both parents.

1435 *Vaarama, A. Inheritance of morphological characters and fertility in the progeny of the hybrid* Rubus idaeus *x* R. arcticus. (*pp. 846–50*).

Investigations were carried out on the open-pollinated F_1, F_2 and F_3 of hybrids between *R. idaeus* and *R. arcticus*. The F_1 hybrid was in most respects intermediate between the two parents. It was almost normal in meiosis, its partial sterility being genic in origin. An analysis of morphological features of the leaf, inflorescence and flower in the F_2 and F_3 by means of Anderson's hybrid-index method was indicative of a conspicuous transition towards the characters of *R. idaeus*. Numerous attempts to back cross F_2 and F_3 individuals with *R. arcticus* only yielded a few seeds, whereas back crosses of F_2 and F_3 individuals with *R. idaeus* were usually successful. It is therefore highly probable that back crossing with *R. idaeus* is responsible for the transition towards the characteristics of this parent, and also for the observed improvement in ♂ and ♀ fertility in the F_2 and F_3. It is however possible that linkage of lethals with morphological characters of the *R. arcticus* type may reduce the number of segregates resembling this parent.

1436 *Blanco, J. L. Genetic variation of pollen size of maize.* (*p. 850*).

With inbreeding, the average size of the pollen increased and the standard deviation for pollen size was reduced. In some inbred lines, pollen size and general combining ability were correlated. Pollen size of F_1 plants heterozygous for a translocation showed a bimodal segregation corresponding with the sizes of the pollen of the two parents.

1437*a* *Leng, E. R. & Woodworth, C. M. Effects of long-term selection for oil and protein content in maize.* (*pp. 864–65*).

These investigations have been referred to in *PBA*, XXIV, Abst. 1964. In addition to the information already provided, it is reported that the four strains selected for high oil, low oil, high protein and low protein content respectively for over 50 generations were noticeably modified in morphological characters and so reduced in vigour that they yielded only half as much grain as commercial hybrids in Illinois.

1437*b* *Panse, V. G. & Bokil, S. D. Statistical properties of characters in quantitative inheritance with special reference to plant breeding.* (*pp. 865–67*).

The analysis of the statistical properties of segregating F_2 and F_3 populations by means of moment-generating functions described in *PBA*, X, Absts. 931 and 950 is extended to cases with 2, 8 and 32 effective factors, three ratios of genotypic and environmental F_2 variance, dominance or no dominance and 5 and 10% selection intensity. Among the results noted are: (1) the marked retardation in advance under selection caused by environmental variance; (2) the more rapid advance due to stringent selection; and (3) the reduction of the covariance of progeny mean and genotypic variance within progeny by a large factor number.

1438 *Smith, H. H. Development of morphologically distinct and genetically isolated populations by interspecific hybridization and selection.* (*pp. 867–70*).

The logarithm of the length of the base of the corolla-tube was used as the basis of selecting the interspecific hybrid between the small-flowered species *Nicotiana langsdorffii* and large-flowered species *N. sanderae* and also the colchicine-induced amphidiploid of this combination. In the F_1 of the hybrid and amphidiploid, types with the smallest, largest and intermediate-sized corolla were selected and then self-pollinated, this process of selection being continued until the F_6. In the F_5, the selections were also back-crossed with each parental species; the amount of pollen sterility in the back-cross hybrids was used as an indication of the genetic isolation between the selections and their parents. The author has previously reported that the polygenic system determining flower dimensions and that conditioning pollen sterility are distinct but linked (cf. *PBA*, XXII, Abst. 2131). Selection at the amphidiploid level was less effective in shifting the means in the desired directions than selection in the diploid hybrid. Percentages of pollen abortion in the three types of F_6 diploid selections were lower than in the F_1, but remained higher than in the parental species. In both the diploid hybrid and amphidiploid, back crosses to *N. langsdorffii* were more sterile than back crosses to *N. sanderae*, even in the case of the small-flowered selections which were phenotypically nearer to *N. langsdorffii*. The diploid selections with intermediate and small flowers may be considered as partially genetically isolated from *N. langsdorffii*, since the back crosses were as pollen sterile as the F_1; the large-flowered selection could not be crossed with *N. langsdorffii* ♂; the reciprocal was not attempted. As would be expected, percentages of sterility in back crosses of the amphidiploid selections to both parents were higher than those involving the $2n$ selections. All the selected lines and back crosses fell within the parental range of corolla-tube size, except in the back cross of the large-flowered F_5 diploid line with *N. sanderae*, which exceeded the large-flowered parent in mean and range.

1439 *Singleton, W. R. The effect of chronic radiation on mutations in maize. I. Endosperm mutations. II. Effects on pollen.* (*pp. 896–97*).

These investigations on the induction of mutation at the loci *Su*, *Pr*, *Sh* and *R* by chronic γ radiation have been referred to in *PBA*, XXV, Abst. 1049.

1440 *Brown, M. S. & Menzel, M. Y. The genetic basis of chromosome pairing in* Gossypium. (*p. 899*).

Evidence from various derivatives of intraspecific and interspecific hybrids is given in support of the hypothesis that at least two chromosomes carry genes for asynapsis, one belonging to the A genome of *G. hirsutum* and the A_2 genome of diploid species and the other to the D genome of *G. hirsutum* and the D_2 genome of diploid cottons.

1441 *Dowrick, G. J. The origin of polyploid progeny in* Pyrus (*var.* Beurré Bedford). (*pp. 899–900*).

Polyploid progeny arose unexpectedly when the pear Beurré Bedford ($2n = 34$) was crossed as ♂ with other $2n$ varieties. It was found that 1% of the pollen mother cells were binucleate as the result of failure of wall formation after premeiotic mitosis and that no cell walls were formed after meiosis in either normal or abnormal pollen mother cells. The four nuclei in pollen grains developed from uninucleate mother cells were arranged separately or in groups of two, three or four, gametes with n, $2n$, $3n$ and $4n$ chromosomes thus being produced. Pollen grains arising from the binucleate mother cells contained eight nuclei but did not appear to be viable.

1442 *Kihara, H. Restoration and substitution of nucleus.* (*pp. 900–02*).

Reciprocal hybrids between *Triticum vulgare* and *Aegilops caudata* were back crossed to the *T. vulgare* parent as ♂. The successive restoration (RB) and substitution (SB) back-crosses resulted, respectively, in the reestablishment of the *T. vulgare* genome set (VV) in its own cytoplasm (β) and the introduction of this genome into the cytoplasm of *Ae. caudata* (α^c). In the F_1 hybrids, $0–5_{II}$ were observed at metaphase I. RB_1 and SB_1 had $2n = 37–50$; 49-chromosome plants were the most common, indicating the frequent production of unreduced ♀ gametes. In further back crossing, use was made of the 49-chromosome plants, whose genomic constitution was supposedly VVC since they formed $21_{II} + 7_I$. By the third back cross, plants with 21_{II} were obtained. In both restoration and substitution, seed fertility became higher in successive back crosses. Pollen fertility also increased in the RB_1–RB_4 but decreased in the course of substitution. The morphology of the RB_1–RB_4 and SB_1–SB_4 gradually became more wheat-like. Foreign cytoplasm appeared to weaken the expression of the dominant *Ae. caudata* gene for nonwaxiness; in the restoration back crosses this character soon disappeared but in the substitution back crosses it remained much longer. The only other *Ae. caudata* genes transferred to the *T. vulgare* genome set were those for black ear (cf. *PBA*, XXII, Abst. 2595). The *T. vulgare* parent had two pairs of SAT-chromosomes. In the RB_3 and SB_3, various combinations of SAT-chromosomes from *T. vulgare* and *Ae. caudata* were found. Presumably one SAT-chromosome of *Ae. caudata* was present in the $\alpha^cV^bV^b$ genotype derived from an open-pollinated SB_2 individual (cf. *loc. cit.*); at least one *Ae. caudata* chromosome may therefore replace one *T. vulgare* chromosome.

1443 *La Cour, L. F. & Rutishauser, A. Sub-chromatid breakage studies in endosperm.* (*p. 902*).

The study described here has already been summarized in *PBA*, XXIV, Abst. 72 and XXV, Abst. 693.

1444 *McLeish, J. The consequences of localised chromosome breakage in* Vicia faba. (*p. 903*).

Localized chromosome breakage has been induced in root tip cells of *Vicia faba,* using maleic hydrazide, in which case 93% of the breaks occur in heterochromatin regions, and 8-ethoxycaffeine, when 86% of the breaks occur in the nucleolar constriction. The resulting acentric fragments carry duplications, deficiencies and translocations influencing the structure and subsequent behaviour of their micronuclei. They may be classified into four types, according to the presence or absence of heterochromatin and nucleolar organizers; those carrying both form viable micronuclei, cooperating with the main nuclei during interphase and becoming synchronized with them during prophase. These acentrics survive and reproduce through successive mitoses and provide markers for timing deferred breakage and reunion arising from the persistent effects of the initial treatment. All types of acentric fragments can survive and reproduce by inclusion in the main nuclei.

1445 *Rettberger, A. Zahlenregeln der Chromozentren der Nebenblattkerne von Cruciferen.* (*Rules for the number of chromocentres in the nuclei of the stipules of crucifers*). (*p. 903*).

In the resting nuclei of very young cells, the number of chromocentres is equal to the number of chromosomes. The number of chromocentres per resting nucleus decreases in older cells but never falls below that of the haploid chromosome number. Increases in temperature lead to a more rapid decrease in the number of chromocentres.

1446 *Tjio, J. H. & Östergren, G. Spontaneous chromosome fragmentation in* Pinus. (*pp. 903–04*).

Spontaneous chromosome fragmentation has been found to occur in 13 of 20 species of *Pinus* studied, in all cases in mitosis in the cotyledons of germinating seedlings. A frequency of 71% of disturbed anaphases was observed in *P. longifolia*; high frequencies were also found in *P. rigida, P. pinaster* and *P. virginiana.* No fragmentation was observed in root-tip mitoses.

1447 *Tischler, G. F. L. Das Problem der Basis-Chromosomenzahlen bei den Angiospermen-Gattungen und Familien.* (*The problem of basic chromosome numbers in genera and families of Angiosperms*). (*pp. 904–05*).

It is suggested that the symbol x be used for the hypothetical basic chromosome number of an entire genus or family and b for the basic chromosome number of polyploids and aneuploids. The number for x is of necessity of monophyletic origin, whereas the numbers for n and b may, in certain cases, be of polyphyletic origin.

1448 *Galán, F. Genética y fenogenética del sexo en* Ecballium elaterium. (*Genetics and phenogenetics of sex in* E. elaterium). (*pp. 942–44*).

The interpretation offered is based on the assumption of three genes a^D, a^+ and a^d responsible for the production of an enzyme in varying quantities.

1449 *Bryson, V. & Davidson, H. Multiple phenotypic effects of induced phage resistance in* Escherichia coli. (*p. 966*).

By the use of two mutagenic agents, ultraviolet irradiation and manganous chloride, mutant forms of *E. coli* have been obtained possessing resistance to phages T1, T2, T3, T5 and T6. All spontaneous mutants are either prototrophs or require tryptophane whereas the induced mutants include many with other specialized nutritional requirements. Mutation to prototrophy occurs more readily in some strains of phage resistant auxotrophs than in others, as does loss of resistance simultaneously with the return to prototrophy. Two possible causes of the simultaneous occurrence of phage resistance and auxotrophy are discussed, (1) that it may arise from two nonallelic genetic events and (2) that it may arise from a single mutation with several effects, probably combined with a suppressor effect at another locus.

1450 *Cavalli-Sforza, L. L. & Jinks, J. L. Observations on the genetic and mating system of* E. coli *K–12.* (*pp. 967–69*).

All possible crosses were made between $M-\ S^R\ Lac\pm\ Az\pm\ Ara\pm$ and $M+\ S\ Lac\mp\ Az\mp\ Ara\mp$ in each of the three crossable mating type combinations, F+ x F−, F− x F+ and F+ x F+, and an analysis made of the recombination frequencies of the unselected markers. The frequency of segregation of unselected markers was found to vary between crosses as a result of genetical and environmental influences. The following linkage group is suggested for the markers so far analysed: $B_1\text{–}M\text{–}Xyl\text{–}Mal\text{–}S\text{–}E\text{–}(Hfr)\text{–}Gal\text{–}T_6\text{–}Lac\text{–}T_1\text{–}Az\text{–}L\text{–}Ara\text{–}T$, the *Gal* and *Ara* loci being those of W945, not allelic with those of W677. *E* refers to a hypothetical locus which is the point of maximum elimination in the gametic contribution from F+ strains and which may coincide with the *Hfr* locus. These results are discussed with reference to other studies of *E. coli.*

1451 *Hunter, M. E. Cytologic evidence for nuclear fusion and reduction division in* Micrococcus cryophilus. (*p. 969*).

It has been observed that the meiotic process in *M. cryophilus* takes place in two divisions, with synapsis occurring between homologous chromosomes, with pairing of chromosomes during prophase of the first division. The haploid chromosome number is two, the chromosomes being distinguished by their size and chromomeric structure. The final result of the meiotic divisions is a tetrad of haploid cells.

1452 *Kaplan, R. W. Untersuchungen über das instabile Stadium beim s-Mutationsvorgang von* Bacterium prodigiosum. (*Studies on the unstable stage in the s mutation process in* B. prodigiosum). (*pp. 969–71*).

Ultraviolet irradiation of a red strain of *B. prodigiosum* resulted in the appearance of a considerable number of colonies with white and red sectors, designated s (sector) colonies; such colonies either reverted, after several generations, to the red type or, in some cases, became white after treatment with certain mutagenic substances. It is postulated that irradiation results in the labilization of a certain allele and that this effect may be rendered permanent by treatment with certain mutagenic substances.

1453 *Lieb, M., Weigle, J. J. & Kellenberger, E. Inheritance of phage transforming and morphological characters in a cross between distantly related strains of* Escherichia coli. (*pp. 971–73*).

Crosses were made between strains C (BTCC122) and K125 which differ in respect of phage transformation, phage λ–C acceptance, S13 acceptance, cell form and nuclear morphology. A large number of recombinants was found carrying markers from the C parent only, suggesting that this is the accepting or F— partner in the cross (cf. *PBA*, XXIII, Absts. 921 and 1713). The C and S13 acceptance abilities and the C transforming ability of the recombinants were the same as those of the C parent but many of the recombinants were intermediate in cell and nuclear morphology and showed independent assortment of these characters. It is suggested that the C transforming character and the C and S13 acceptance abilities are inherited as a unit and may even be nonchromosomal.

1454 *Ravin, A. W. On the frequency of autogenic and allogenic transformations in* Pneumococcus. (*pp. 974–77*).

A quantitative method for measuring the frequency of colonies containing transformed bacteria and its use in the study of the action of TP (transforming principle) from cells of strain SIII–2 on cells of strain SIII–1 are described (cf. *PBA*, XXIV, Abst. 97). The frequency of colonies containing transformed cells was measured as a function of the concentration of TP in the medium and it was found that although autogenic and allogenic transformations were independent of each other both increased as the concentration of TP in the medium increased. In the case of autogenic transformations the frequency of colonies in which no transformations could be detected decreased exponentially with increasing concentration of TP, indicating that very few transformations occur in the absence of TP but that each colony is equally capable of having transformations induced in it. However in the case of allogenic transformations this linear relationship was only found at low concentrations of TP SIII–2 and no transformations were induced in about 30% of the colonies. This limitation of the maximum frequency of colonies containing allogenic transformations could be removed by decreasing the viscosity of the medium without altering the growth rate of the cells, suggesting that the rate of diffusion of some substance essential to, or inhibitory of, transformation is affected by the viscosity of the medium. It is concluded that if the same agent in TP SIII–2 induces both types of transformation the environment plays an important role in determining the result of effective contact between the TP unit and the sensitized bacterium. The limitation of allogenic transformations under certain conditions appears to be a specific attribute of the SNIII–1/SNIII–2 pair of transforming agents since no such limitation was found with two other TPs studied.

1455 *Rothschild, B. de. Mutant equilibrium in the chemostat.* (*p. 977*).

Two suggestions are made to account for the mutant equilibrium which occurs in some cases in bacterial cultures growing in the chemostat: firstly that the newly arisen mutant is selected against since experimental results indicate that the new mutant suffers an apparent delay in the onset of division due to nuclear segregation, and secondly that a lowered mutation rate may contribute to the stationary level.

1456 *Ryan, F. J. The nature of differences in fitness arising in bacterial populations.* (*pp. 977–79*).

The appearance of fitter types in cultures of *Escherichia coli* grown continually in chemically defined media is discussed. At any time a culture is heterogeneous with respect to fitter types, which appear at random and continually, suggesting that they arise by a process of random mutation. Only rarely have new morphological or biochemical characteristics been shown by a fitter strain and any such characteristics found did not appear to be related to the fitness of the strain possessing them. Several possible explanations of the selective advantage of the fitter types are postulated including (1) an intrinsically faster rate of logarithmic growth, (2) shorter lag periods, (3) logarithmic growth for a longer period and (4) better survival in the stationary phase, of which the first has been detected in a few cases where the fitter type had a generation time 10% less than that of the original strain. When the two strains are growing together the growth of the less fit is suppressed although no indirect toxic effect, no development of lysogenicity and no effects of the culture medium could be detected. The successive accumulation of toxic materials in the cell surface is suggested as a possible explanation of the observed effect but it is pointed out that fitness may involve both progressively better adjustments to the culture medium and some ability to suppress other bacteria.

1457 *Stocker, B. A. D., Zinder, N. D. & Lederberg, J. Phage transduction of flagellar characters in* Salmonella. (*pp. 979–80*).

Cf. *PBA*, XXIV, Abst. 1642.

1458 *Alcaraz, E. Genetics problems concerning the improvement of the tobacco in Spain.* (*pp. 980–82*).

Progress made in tobacco breeding in Spain since 1933 is summarized.

1459 *Boerger, A. Estado actual de la genética rioplatense.* (*Present state of genetics in the countries of the Río de la Plata*). (*pp. 983–84*).

Reference is made to the double-cross maize hybrids Santa Fe 3 and FAV355 produced in Argentina and synthetic hybrids in Uruguay, lucernes immune to nematode (*Ditylenchus dipsaci*) in Argentina and ryegrass resistant to *Schizaphis graminum* and *Puccinia coronata* and oats resistant to *P. coronata* in Uruguay.

1460 *Bolsunov, I. La possibilité de la fixation d'hétérosis chez les plantes autogames et son importance pour la sélection pratique.* (*The possibility of fixing heterosis in autogamous plants and its importance for practical breeding*). (*pp. 985–93*).

Intervarietal crosses carried out between inbred lines of *Nicotiana rustica* and *N. tabacum* displayed hybrid vigour in the F_1; rigorous selection from among these hybrids resulted in some lines that maintained hybrid vigour in subsequent generations. It is suggested that the conservation of hybrid vigour in later generations is due to a strong linkage between genes for growth vigour and that careful line selection makes it possible to concentrate in a homozygous condition all or most of the genes responsible for the heterosis effect in the F_1.

1461 *Chopinet, R. & Dujardin, J. Étude de quelques écotypes français de* Dactylis glomerata *L. en vue de leur utilisation agronomique.* (*Study of some French ecotypes of* D. glomerata *L. with a view to their agronomic utilization*). (*p. 994*).

The substance of this article has been summarized in *PBA*, XXVI, Abst. 1353.

1462 *Crescini, F. & Rozza, S. Dimorfismo sessuale secondario diurno e notturno in* Cannabis sativa *L.* (*Diurnal and nocturnal secondary sexual dimorphism in* C. sativa *L.*). (*pp. 994–1003*).

Greater increase in length was observed during the hours of night than of day, the male plants showing a greater rate of increase than the females.

1463 *Fischer, G. I. Genética en calidad triguera.* (*Genetics in wheat quality*). (*pp. 1003–06*).

Arguments are presented for beginning quality determinations in the early hybrid generations and reference is made to a method devised by the author and collaborators for estimating quality on a portion of the endosperm of a grain without affecting the germinating power of the embryo. The endosperm of the grains produced by F_1 hybrids was found to resemble that of the seed parent.

1464 *Henderson, M. T. & Self, F. W. Estimating the number of genes governing strength of fiber in American Upland cotton.* (*p. 1006*).

The results of a study of crosses between a variety of *Gossypium hirsutum* with low fibre strength and one with high fibre strength indicate that four pairs of genes are involved in the determination of fibre strength.

1465 *Bradshaw, A. D. Local population differences in* Agrostis tenuis. (*pp. 1026–28*).

Samples from 30 populations from a small region near Aberystwyth were grown under identical conditions in an experimental garden and examined after two years. Major differences were found between populations from habitats which were considerable distances apart and significant differences were also found between those growing 100 m. or less away from each other, where there were marked environmental differences between the habitats but not where environmental differences were small. These results are discussed with reference to other examples, including the contamination of seed crops of maize and ryegrass and it is concluded that such local population differences are to be expected whenever differences in selection of two different adjacent environments is sufficient to overcome the effects of gene flow.

1466 *Covas, G. Base genética de la taxonomía del género* Hordeum, *sección* Cerealia. (*Genetic basis of the taxonomy of the genus* Hordeum, *section* Cerealia). (*pp. 1028–34*).
A study of crosses involving *H. spontaneum, H. agriocrithon, H. distichon, H. intermedium, H. irregulare* and *H. hexastichon* has shown that they differ in relatively few genes and their genomes are completely homologous. Marked heterosis has been observed in certain combinations, *e.g. H. irregulare* x *H. spontaneum*; however, even forms of very divergent geographical origin, such as *H. irregulare* from Ethiopia and *H. vulgare* var. *coeleste* from Tibet, gave fully fertile hybrids in which meiotic pairing was quite regular; several of the species were found to possess allelic genes. The results suggest that the species of the section *Cerealia* constitute a single species *H. vulgare* L. and that all of them, with the possible exception of *H. spontaneum* and *H. agriocrithon*, have arisen since the beginning of barley cultivation; *H. spontaneum* is regarded as the basic type and *H. agriocrithon* as a derived type rather than the prototype of the cultivated barleys.

1467 *Daday, H. Geographical distribution of gene frequencies in populations of* Trifolium repens *L.* (*pp. 1034–36*).
Investigations of the frequencies of the lotaustralin and linamarase genes have shown that in the northern hemisphere the distribution of dominant allele frequencies in populations is closely correlated with the January isotherms. In Europe and the Near East a decrease of 1° F. in January mean temperature resulted in a reduction of about 4% in the frequency of the glycoside gene and 3% in the enzyme gene. A similar change correlated with altitude was found in the Central European alps. In North America greater variation was found in the dominant allele frequency but populations were found showing a decreasing frequency of dominant alleles from south to north. In the southern hemisphere no gradual change in any direction, corresponding to that in the northern hemisphere, could be detected.

1468 *Feinbrun-Dothan, N. Chromosomes and taxonomic groups in* Allium. (*pp. 1036–41*).
Data are provided on the distribution of the basic chromosome numbers, $x = 7$, 8 or 9, and the degree of polyploidy in 11 sections of *Allium*, together with diagrams of seven of the main caryogram types occurring in the genus. The number of caryograms found within each section corresponds to the number of basic chromosome numbers except in the case of sect. *Rhizirideum* where $x = 7$ ($2n = 14$ or 28) or 8 ($2n = 16$, 24, 32 or 48) but four caryogram types are found. Anatomical studies of species having leaves with a flattened lamina have shown that they may possess vascular bundles in one horizontal row, with phloem facing the lower surface, or in two horizontal rows, with the phloem facing outwards, and in all cases where chromosome numbers are known the former group have $x = 7$ and the latter $x = 8$. The bearing of this work on the origin of the three basic chromosome numbers and on the taxonomy of the genus is briefly discussed.

1469 *Mudd, S. The differentiation of nuclei and cytoplasmic organelles in bacteria.* (*pp. 1084–85*).
Differential staining within some bacterial cells has been obtained in species of *Mycobacterium, Corynebacterium, Bacillus, Salmonella, Escherichia, Proteus* and cocci, showing that in most cases the mitochondrial granules occupy a position nearer the periphery of the cell than do the nuclei. In some bacteria nuclear and mitochondrial sites have been distinguished in living cells by phase-contrast microscopy and in desiccated cells by electron-microscopic density. It is suggested that the organization of bacterial cells in respect of aerobic energy exchange and underlying genetic continuity is essentially similar to that of cells of higher animals and plants.

1470 *Castro, D. de, Noronha-Wagner, M. & Câmara, A. Two artificial karyological races of* Luzula purpurea. (*pp. 1085–87*).
Two reciprocal translocations involving the nucleolar chromosome were obtained following X-ray treatments of seedlings. In the first the nucleolus is attached to the smaller chromosome and in the second to the larger, the latter translocation being obtained only in the homozygous condition. Mitosis in both cases was

regular, as was meiosis in translocation II. In the case of translocation I, abnormalities, especially bridge formation, were observed in both the homozygous and heterozygous condition. The offspring of translocation heterozygotes included morphologically normal and abnormal plants, all of the latter group showing various meiotic irregularities, while the former group included cytologically normal as well as abnormal plants. It is suggested that inviable and morphologically abnormal plants are due to duplications and deficiencies and that bridge formation followed by fragmentation may be one of the mechanisms leading to agmatoploidy.

1471 *Malheiros-Gardé, N. & Gardé, A. Nucleolar and spindle peculiarities in* Luzula. (*pp. 1087–91*).

The behaviour of the nucleolus of *L. campestris* in meiosis, in particular the development of micronucleoli which can be observed in some cases not only in prophase but also in metaphase, anaphase and telophase, leads the authors to put forward two possible explanations of the presence of micronucleoli: firstly, the suggestion which the authors themselves prefer, that the continued presence of micronucleoli after the deposition of nucleoproteins on the chromomemata is completed may be due to overproduction of nucleoproteins by the nucleolus; and secondly that two qualitatively distinct types of micronucleoli exist, the first carrying substances essential to the matrix and the second carrying byproducts of the transformation reactions of the nucleolar substance. These results are discussed with reference to work with other genera.

Spindle behaviour in *L. campestris* and *L. forsteri* is also described. In plants of a dwarf colony of *L. campestris* from Escurial, in Spain, polar spherules have been observed attached to both ends of the long, sometimes curved spindles. These spherules are similar to nucleoli in staining reaction, shape and structure, suggesting a possible interrelationship between the spindle and the nucleolar mass.

1472 *Hagberg, A. Cytogenetic studies on "erectoides" mutations in barley.* (*p. 1092*).

About 40 *erectoides* mutations have been cytologically studied and have been found to behave as single factor mutations, recessive in all but one case as regards density of ear. At least 16 loci are known to affect internode length in the ears but at most of these only one *erectoides* mutation has been found although they show differing mutability. They have a pleiotropic effect on the phenotype and are recessive for some properties and dominant for others, superdominance being sometimes found for some complex characters such as grain yield and total plant weight. Two alleles may exert a complementary effect, causing monofactorial heterosis. Two of the mutations are closely linked to translocation points, one being localized in the somatic chromosomes. Meiotic studies have shown that interstitial chiasmata are terminalized through nonhomologous parts of the chromosomes and that two types of open ring tetravalents may occur.

1473 *Groszmann, A. & Schreiber, G. Biometrical and cytological researches on tissues of inbred and hybrid corn caryopsis.* (*pp. 1093–94*).

Instability in the nuclear constitution of endosperm giant nuclei, due to a lack of coordination between the reproductive rhythms of chromonemata and centromeres, is suggested by the following observations: (1) the completely despiralized condition of the chromomeres, resembling pachytene, (2) frequent pairing of the threads with corresponding chromomeres, (3) differences in polyteny between different chromosomes in the same nucleus and between the three representatives of chromsome VI, (4) differences in the number of threads in different regions of the same chromosome, (5) chiasma-like structures between four or eight threads, (6) polyploidy of the cells, indicated by the relations between the nucleoli and nuclear organizers of chromosome VI and (7) lampbrush structures in some nuclei with two or four strands and loops or nonpairing segments.

1474 *Mendes, A. J. T. Monosomics in* Coffea arabica *L.* (*p. 1095*).

Selfing of the monosomic ($2n = 43$) *angustifolia* form of *C. arabica* gave rise to normal $2n = 44$ plants and $2n = 43$ *angustifolia* plants. Normal ♀ x monosomic ♂ gave only normal $2n = 44$ progeny while monosomic ♀ x normal ♂ gave both types. It is suggested that these results could be explained by equal fertility of ♀ gametes with 21 or 22 chromosomes and sterility of 21-chromosome ♂ gametes. This is confirmed by the results of the cross between a "cytological" *angustifolia* ♀ (*AgAg*, $2n = 43$) and a "genetical" *angustifolia* ♂ (*agag*, $2n = 44$), giving heterozygous F_1 progeny (*Agag*) with $2n = 43$ or 44.

Selfing of a heterozygous monosomic F_1 plant gave normal and *angustifolia* seedlings in the ratio of 3 : 5, as would be expected on the basis of Mendelian segregation of *Agag* and sterility of 21-chromosome male gametes.

1475 *Harm, W. & Stein, W. Neuere Ergebnisse zur UV-Inaktivierung von* Escherichia coli *und ihre Beziehungen zur Mutationsforschung.* (*Recent results of ultraviolet inactivation of* E. coli *and their bearing on research on mutations*). (*pp. 1096–99*).

Cells of strain B of *E. coli* inactivated after ultraviolet irradiation could be divided into two categories, those exhibiting nongenetical lethal effects and those showing lethal effects due to mutations induced by the irradiation. It was found possible to distinguish between these two types of inactivation by means of heat treatment after irradiation; cells that could not be reactivated by this method belonged to the second category.

1476 *Martinoli, G. Effetti citologici indotti da raggi ultravioletti su meristemi apicali di* Scilla obtusifolia *Poir.* (*Cytological effects induced by ultraviolet rays on apical meristems of* S. obtusifolia *Poir.*). (*p. 1100*).

The changes induced by ultraviolet rays comprised a lower proportion of breakages, bridges and restitutions than those induced by X rays; stickiness on the other hand was more frequent.

1477 *Mikaelsen, K. Chemicals as protective agents against chromosome aberrations induced by ionizing radiations.* (*pp. 1100–04*).

Evidence is presented of the protective effect shown by glutathione, cysteine, thiourea, sodium hyposulphite and sodium cyanide in reducing the amount of chromosome fragmentation caused by chronic irradiation by γ-rays. The degree of protection afforded depends on the concentration of the chemicals, up to a point at which a toxic effect is shown in the case of glutathione and sodium hyposulphite, but with sodium cyanide the reduction in fragment frequency is about half that shown by the other chemicals tested. Possible explanations of the mechanism of the protective effect are discussed with reference to other work in the same field.

1478 *Raut, C. & Bowles, A. The effect of ultraviolet irradiation on normal and on cytochrome-deficient yeast strains.* (*pp. 1104–05*).

No differences in lethal effects were found between normal and cytochrome-deficient strains after ultraviolet irradiation at 2537 Å. but about half the survivors of irradiated normal cells produced small cytochrome-deficient colonies. Spectroscopic examination of ten of these colonies showed the absence of cytochromes a and b but the presence of cytochrome c. In two cases the cytochrome deficiency was shown to be due to the mutation of a single gene, since on crossing with a normal strain a 2 : 2 segregation was shown by tetrad analysis. The majority of the cytochrome-deficient colonies were shown to be petites, indicating that irradiation caused not only gene mutation but also, and to a greater extent, destruction or inactivation of the cytoplasmic particles necessary for the production of the complete cytochrome system.

1479 *Sparrow, A. H. Somatic mutations induced in plants by treatment with X and γ radiation.* (*pp. 1105–06*).

Colour changes believed to result from somatic mutation were induced in leaves and petals of numerous plants, including apple, castor oil plant and *Nicotiana sanderae*, after exposure of the dormant seeds, bulbs, rhizomes or growing plants to acute X-ray treatment or chronic γ-radiation. In some cases the mutant sectors were sufficiently large to be propagated asexually. In work on *Antirrhinum majus* the number of mutant spots per unit area observed after γ irradiation did not appear to increase linearly with dosage.

1480 *Melchers, G. & Mundry, W. Mutation und Rückmutation beim Tabakmosaikvirus in Abhängigkeit von der Kulturtemperatur der Wirtspflanzen.* (*Mutation and reverse mutation in the tobacco mosaic virus dependent upon the temperature at which the host plants are grown*). (*pp. 1106–07*).

Tobacco mosaic virus inoculated into plants grown at 32° C. produced a higher percentage of mutations and reverse mutations than virus inoculated into plants grown at lower temperatures. It was not established whether the higher percentage of mutants obtained was due to an increased rate of mutation or merely to an increase in the rate of reproduction of the virus.

1481 *Ephrussi, B., Hottinguer, H. & Roman, H. Sur le comportement des mutants à déficience respiratoire de la levure dans les croisements.* (*On the behaviour, in crosses, of yeast mutants deficient in respiratory activity*). (*pp. 1112–13*).

Two distinct types of mutants deficient in respiratory activity were found to occur in yeast. Both types were biochemically identical but differed markedly in their behaviour in crosses with normal yeast. Crosses of the first type, designated neuter petites, with normal yeast gave rise to cells that were completely normal as regards respiratory activity. On the other hand, the progeny of crosses between normal yeast and mutants of the second type, designated suppressor petites, were characterized by the absence of a self-reproducing cytoplasmic factor controlling respiratory activity.

1482 *Fincham, J. R. S. The effect of a gene mutation on enzymatic constitution in* Neurospora). (*pp. 1113–15*).

Extracts from a mutant strain of *N. crassa* requiring α-amino nitrogen for growth contained no detectable glutamic dehydrogenase or enzyme inhibitor (cf. *PBA*, XXV, Abst. 732). Genetic analysis of a reverse mutation indicated that the restoring gene was at the same or a closely linked locus. The mutant gene appeared to have no effect upon the concentrations of other enzymes.

1483 *Heslot, H. Contribution à la génétique de l'Ascomycète homothallique* Sordaria macrospora (*Auersw*). [*Contribution to the genetics of the homothallic ascomycete* S. macrospora (*Auersw*)]. (*pp. 1115–17*).

Irradiation of spores and mycelia of *S. macrospora* with X rays gave rise to 12 kinds of mutants differing from the parent type in colour of the spores and perithecia, fertility and rate of growth. The genetical basis of the inheritance of these characters was studied in crosses involving the 41 mutants obtained and the initial strain.

1484 *Pritchard, R. H. Ascospores with diploid nuclei in* Aspergillus nidulans. (*p. 1117*).

The incidence of diploid ascospores is of the order of 0·1% of the viable ascospores. A practicable method of identification involves the use of a cross between two linked nutritional markers in repulsion (*Ab*/*aB*), with a recombination frequency of 1·0%. Under these conditions about a fifth of the prototrophs produced are diploid (*Ab*/*aB*) and the remainder are haploid recombinants (*AB*). Ascospores with aneuploid nuclei are also produced, in greater numbers than the diploids. Diploid nuclei could arise by at least three mechanisms, viz. (1) failure of meiosis, (2) failure of the products of first or second meiotic division to separate and (3) fusion of the haploid products of meiosis. There is evidence that more than one of these mechanisms operates.

1485 *Alcaraz, E. The transmission of resistance to mosaic in tobacco hybrids.* (*pp. 1118–21*).

It is suggested that the three recessive factors determining resistance in Ambalema (cf. *PBA*, VIII, Abst. 914 and XIX, Abst. 1975) are additive in effect and that the different degrees of resistance observed in some varieties and in some Ambalema hybrids (cf. *PBA*, XXVI, Abst. 2689) result from the absence of one or more of these factors.

1486 *Boerger, A. Selección de resistencia en el Uruguay.* (*Breeding for resistance in Uruguay*). (*pp. 1121–23*).

Reference is made to the production of wheats such as Larrañaga and Artigas, resistant to *Puccinia graminis* and the Litoral [Littoral] group resistant to *P. glumarum* and to *Ustilago tritici*; forms of *Avena sativa* and *A. strigosa* resistant to *P. coronata*; Tabaré and other flax varieties resistant to *Fusarium* wilt and E2E3 resistant to *Septoria*; and a form of *Lolium multiflorum* resistant to *Schizaphis graminum* and *P. coronata*.

1487 *Cameron, J., Baines, R. C. & Clarke, O. F. Resistance of hybrids of the trifoliate orange to infestation by the citrus nematode.* (*pp. 1123–24*).

Poncirus trifoliata, which is resistant to *Tylenchulus semipenetrans*, was used as pollen parent in crosses with five susceptible *Citrus* species. A high proportion of hybrid seedlings, which were recognized by the dominant trifoliate character, was free or nearly free from infestation, while apomictic seedlings produced at the same time were usually severely attacked.

1488 *Husfeld, B. Über die Beeinflussung der* Plasmopara-*Resistenz interspezifischer* Vitis-*Kreuzungen durch das* vinifera-*Genom.* (*On the influence of the* vinifera *genome on the* Plasmopara *resistance of interspecific* Vitis *crosses*). (*pp. 1124–28*).

Cultivated varieties of *V. vinifera* are completely lacking in genes for resistance to *P. viticola*; wild forms of *V. riparia* from North America, however, possess a high degree of polygenically determined resistance to this disease. A considerable number of the F_2 hybrids of crosses between these two species possessed resistance and, when these hybrids were back crossed to their respective cultivated parents, many of the back-cross progenies were found to possess a higher degree of resistance than the original hybrids, the degree of resistance varying according to the cultivated parent employed. This phenomenon is attributed to the presence of a polygenic complex in *V. vinifera* which, in the pure variety, has no connexion with resistance to *P. viticola* and presumably determines some other, as yet unestablished, character. In combination with genes for resistance from *V. riparia*, however, the genes act polymerically and intensify the degree of resistance of backcross progenies.

1489 *Ross, H. Die Vererbung der Immunität gegen das X-Virus in tetraploidem* Solanum acaule. (*The inheritance of immunity to virus X in tetraploid* S. acaule). (*pp. 1128–32*).

Resistance to virus X in *S. acaule* ($2n = 48$) was shown to be determined by a single dominant gene, inherited on a disomic basis. Crosses carried out between *S. acaule* and *S. stoloniferum* ($2n = 48$) with a view to combining the resistance of the former species to virus X with the resistance of the latter to virus Y were largely successful. The chromosome numbers of the hybrids varied between 36 and 48 and meiosis tended to be irregular, especially in plants with a chromosome number below 48. The F_2 of this cross produced considerably fewer plants resistant to virus X than expected; this discrepancy may be due to the elimination of the *acaule* chromosome bearing the gene for resistance to virus X or to the fact that the *acaule* chromosomes containing this gene impair the viability of the hybrid. Crosses of *S. acaule* with $4n$ *S. tuberosum* were largely unsuccessful but crosses with $8n$ *S. tuberosum* were easily effected. It is suggested that, in breeding for combined resistance to viruses X and Y, better results may be obtained by first crossing each wild species with *S. tuberosum* and then crossing the resulting hybrid lines, after they have been back crossed several times to the cultivated parents.

1490 *Stanton, W. R. Distribution of sources of resistance to the rust of maize* Puccinia polysora *Underw.* (*p. 1133*).

All local varieties of maize in West Africa have proved susceptible to *P. polysora* and little resistance has been found among other African or Asiatic strains. Varieties from Central America, where the rust is endemic, all carry resistance, but North American maizes are less resistant and vary in reaction. A few of the varieties tested were highly variable in reaction but most were either susceptible or resistant.

1491 *Welsh, J. N. & Johnson, T. Inheritance in oats of reaction to race 7A and other races of oat stem rust,* Puccinia graminis avenae. (*p. 1134*).

Cf. *PBA*, XXIV, Abst. 2882.

1492 *Welsh, J. N., Peturson, B. & Machacek, J. E. Associated inheritance of reaction to races of crown rust* Puccinia coronata avenae *Erikss., and to Victoria blight,* Helminthosporium victoriae *M. and M., in oats.* (*pp.* 1134–35).

Cf. *PBA*, XXIV, Abst. 1907.

1493 *Montaldo-Bustos, A. El* Phytophthora infestans *en la papa en Chile.* (Ph. infestans *on potato in Chile*). (*pp. 1135–39*).

The introduction of *Ph. infestans* from Argentina in 1949 caused serious epidemics of blight in potatoes in Chile in ensuing years, the local variety Corahila being very susceptible. Efforts are now being made to introduce varieties possessed of field resistance due to hypersensitivity.

1494 *Frahm-Leliveld, J. A. The topographical situation of the gene centers and its influence on the evolution of species.* (*pp. 1141–43*).

It is pointed out that the gene centres of many plant groups are situated in arid areas characterized by unstable climatological conditions which would give seeds with a long period of dormancy a selective advantage. Since it has been found that rate of mutation often increases with age of seeds, it is argued that climate, by selecting for dormancy, may indirectly affect mutation rate and thus lead to the establishment of a gene centre.

1495 *Sachs, L. Reproductive isolation in* Triticum. (*pp. 1145–46*).

Interspecific reproductive isolation is found (*a*) between species with differing degrees of polyploidy; (*b*) among tetraploids as a result of gross or cryptic structural differences between chromosomes, the latter type being found in some *T. timopheevi* x *T. dicoccoides* crosses (cf. *PBA*, XXIII, Abst. 2572); and (*c*) among hexaploids as the effect of a semilethal gene combination such as occurs in crosses between *T. macha* and other hexaploids (cf. *PBA*, XXIII, Abst. 2556).

1496 *White, O. E. Geographical distribution of organisms in relation to temperature tolerance and mutation.* (*pp. 1146–50*).

Examples are given of tropical species, individuals of which have survived transplantation to regions much colder than their native habitats. It is suggested that mutants tolerating a wider temperature range than is indicated by their distribution occur in all populations; the bearing of this on evolutionary problems is discussed.

1497 *Armstrong, J. M. Cytological studies in alfalfa polyploids. (p. 1171).*

Studies of meiotic pairing in the normal tetraploid of *Medicago sativa*, the induced octoploid and the hexaploid produced by crossing $4n$ and $8n$ plants indicate that the tetraploid is of autoploid origin.

1498 *Burnham, C. R. Studies of crossing-over and chromosome segregation in maize translocations. (pp. 1171–72).*

Crossing over was studied in maize stocks with a ring of four involving a breakage in chromosome 6, which carries the nucleolar organizer. Two stocks were used: stock 1, with an inversion in normal chromosome 5, was produced by crossing a stock heterozygous for the translocation 5–6c, in which the break in chromosome 6 is in the short arm adjacent to the centromere, with one heterozygous for the pericentric inversion 5a, which includes about 80% of the interstitial segment between the translocation break and the centromere; and stock 2, in which the inversion was in translocated chromosome 5, was produced by crossing a normal stock with one carrying both 5–6c and 5a. In stock 1, the three-strand double crossovers and the single crossovers occurring in the inverted portion of the interstitial segment, when followed by alternate or adjacent–1 segregation, resulted in the formation of a microspore quartet of the cross-over type, in which one spore has diffuse nucleoli. In stock 2, when the same cross-overs occurred in the same inverted segment, alternate segregation yielded a normal quartet while adjacent–1 segregation resulted in a quartet having two spores with diffuse nucleoli. The increase in the frequency of these two types of quartet balanced the decrease in numbers of quartets of the cross-over type, indicating that both alternate and adjacent–1 segregations occur when crossing over takes place in the interstitial segments.

1499 *Griffiths, D. J. & Thomas, P. T. Genotypic control of chromosome loss in* Avena. *(pp. 1172–75).*

Three selections from the F_6 of *A. sativa* x *A. byzantina* were normal in appearance and fully fertile with $2n = 42$ but gave 90% sterile dwarfs with $2n = 40$ on selfing, the remaining plants being of the phenotypically normal unstable type. Meiosis was regular in the unstable plants but chromosome elimination resulting in the formation of the nullisomic dwarfs occurred during mitosis in the embryo prior to dormancy. The sterile dwarfs usually showed regular meiosis. On crossing the unstable line with a normal true-breeding *A. sativa* line, a normal uniform F_1 with $2n = 42$ was obtained followed by an F_2 which segregated into dwarf and normal plants, indicating that chromosome loss was a genetically controlled recessive character. The F_2 showed a wide range in both fertility and vigour, the association between these two characters being less pronounced than in the progeny of the selfed unstable parent. Cytological examination of the F_2 showed that in many plants, especially in the intermediate forms, cells with 40, 41 and 42 chromosomes were to be found within the same anther, suggesting that chromosome elimination in these plants had been delayed.

1500 *Hunziker, J. H. Estudio citogenético de un híbrido entre* Elymus *y* Agropyron *(Gramineae). [Cytogenetic study of a hybrid between* Elymus *and* Agropyron *(Gramineae)]. (p. 1180).*

Cf. *PBA*, XXVI, Abst. 1369.

1501 *Jakob, K. M. The cytogenetics of some hybrids and an allopolyploid in the genus* Bromus *(Section* Bromopsis). *(pp. 1180–82).*

Interspecific hybrids between diploid species ($n = 7$) were highly sterile and showed a slight but significant reduction in chiasma frequency compared with the parent species and with intraspecific hybrids, which had closed bivalents and 75–95% fertility. By means of colchicine treatment the pollen fertility of *B. ciliatus* x *B. laevipes* was increased from less than 1·0% in the F_1 to 43·3% in the tetraploid C_1. There were indications of segregation for pollen fertility in the C_2 generation. Heterogenetic metaphase association giving a high frequency of multivalents occurred in the C_2 and some heterogenetic pairing was also observed, but lack of complete homology between the parental genomes was indicated by the occurrence of homogenetic pairing. Interspecific sterility did not appear to be determined by lack of chromosome homology alone. In the reciprocal of the above cross, involving a different strain of *B. laevipes*, the expression of sterility before meiosis because of complete lack of sporogenous tissue suggests that a cytoplasmic or genic mechanism may also operate.

1502 *Simonet, M. Étude cytogénétique de l'amphidiploïde* Aegilops ventricosa *x* Triticum dicoccoides. *(Cytogenetical study of the amphidiploid* Ae. ventricosa *x* T. dicoccoides). *(pp. 1182–83).*

Direct crosses of *Ae. ventricosa* ($2n = 28$) with *T. vulgare* ($2n = 42$) with a view to transferring the valuable properties of the former species, which include profuse tillering and resistance to drought and *Cercosporella herpotrichoides*, to *T. vulgare* have so far proved unsuccessful. Crosses were therefore carried out between *Ae. ventricosa* and *T. dicoccoides* ($2n = 28$) with a view to crossing the hybrids obtained with *T. vulgare*. The F_1 of *Ae. ventricosa* x *T. dicoccoides* had mostly $2n = 56$, although some plants with $2n = 54$ or 55 were observed. Apart from the occurrence of a few tetravalents, trivalents and univalents, meiosis in the pollen mother cells was regular; 85–90% of the pollen grains were well-formed and seed set amounted to 1–3 grains per ear. The F_1 hybrids resembled the *Aegilops* parent in their resistance to *Cercosporella herpotrichoides*, in their profuse tillering and in the shape and size of their ears and glumes and the *Triticum* parent in most other morphological characteristics. They were also more resistant to shattering than either parent. Back crosses to *T. timopheevi* gave rise to fertile plants with $2n = 42$. The hybrids were also crossed with *T. vulgare*, giving rise to plants with $2n = 49$.

1503 *Tschermak-Woess, E. Der Ablauf der Endomitose bei Angiospermen. (The course of endomitosis in Angiosperms). (pp. 1184–85).*

The role of endomitosis in tissue differentiation is discussed, with special reference to mitosis induced by the formation of lateral roots (cf. *PBA*, XXIV, Abst. 69).

1504 *De Lamater, E. D. Evidence for the structure of the divisional mechanism of bacterial nuclei and chromosomes. (p. 1185).*

Appropriate staining and dehydration methods have enabled the author to identify the prophase, metaphase, anaphase and telophase stages of mitosis in bacterial nuclei and to observe the mitostatic and polyploidizing effects of colchicine, formaldehyde and antibiotic substances.

1505 *Dumon, A. G. The heredity of chlorophyll deficiencies in* Secale cereale *L. (pp. 1221–25).*

Three series of multiple alleles controlling chlorophyll production have been studied in rye, namely: C_1, cl_1 and c_1; C_2, cl_2 and c_2; and W, wl and w. Their interactions are as follows: the genotype C_1C_2W gives normal green plants (*typica*); the genotypes C_1C_2w and C_1C_2wl produce *subtypica* plants which are green but less well developed than *typica*; C_1c_2W and c_1c_2W, the *virescens* type; C_1c_2wl and c_1c_2wl, the lethal *virescens* type; cl_1C_2w, the sublethal *lutescens* type; C_1cl_2w, the lethal *lutescens* type; and C_1c_2w, c_1C_2w and c_1c_2w, the *albina* type.

1506 *Jones, D. F. Gene and cytoplasm interaction in species separation. (pp. 1125–27).*

Examples of interaction between cytoplasm and genotype resulting in cytoplasmic male sterility or in restoration of fertility to cytoplasmically male-sterile material are presented, the crops discussed being maize, *Nicotiana*, *Sorghum* and other genera. It is suggested that such interaction, leading to failure to produce functional gametes, is an early stage in speciation.

1507 *Mazoti, L. B. Caracteres citoplasmáticos heredables derivados del híbrido de* Euchlaena *por* Zea. *(Cytoplasmic hereditary characters derived from the hybrid of* Euchlaena *by* Zea*). (pp. 1228–31).*

Cf. *PBA*, XXV, Abst. 3023.

1508 *Mazoti, L. B. Variación citoplasmática heredable y su reversión por acción de genes simples en maíz. (Heritable cytoplasmic variation and its reversion by the action of simple genes in maize). (pp. 1231–33).*

Cf. *PBA*, XXV, Abst. 3024.

1509 *Mitchell, H. K. & Mitchell, M. B. Cytoplasmic inheritance in* Neurospora crassa. *(p. 1233).*

Cf. *PBA*, XXIII, Abst. 947.

1510 *Burdick, A. B. Epistasis as a cause of heterosis in the tomato* (Lycopersicon esculentum). *(pp. 1235–37).*

All but three of the 28 possible hybrids among eight dissimilar parents showed greater plant size (green weight) at 90 days than the larger parent. Constant parent regression analysis of the data indicated that the heterotic effect could be attributed to epistasis (cf. *PBA*, XXV, Abst. 3504).

1511 *Barricelli, N. A. L'impiego di elementi numerici autoriproduttivi ("geni" numerici) per verificare le basi teoriche dell'ipotesi della simbiosi dei geni. [The employment of self-reproducing numerical elements (numerical "genes") to verify the theoretical basis of the hypothesis of gene symbiosis). (p. 1238).*

The use of the electronic computer is illustrated

1512 *Barricelli, N. A. Organismi numerici e fenomeni di carattere "bionumerico" apparsi durante esperimenti eseguiti mediante il calcolatore elettronico di Princeton, N.J., U.S.A. (Numerical organisms and phenomena of a bionumerical character which have appeared during experiments carried out with the electronic computer of Princeton, NJ, USA. (p. 1239).*

The way in which the addition or substitution of one or a few genes may lead to greater adaptation to the environment is illustrated.

1513 *Bennett, J. H. The theory of random mating. (p. 1239).*

The determination of genotypic frequencies in successive generations of disomic and polysomic panmictic populations is considered. The recurrence relations for the frequencies of gametic genotypes constitute a system of linear difference equations when fewer than four linked loci are considered; the difference equations become quadratic with four or more linked loci. The genes at linked polysomic loci are associated at random at equilibrium (cf. *PBA*, XXV, Abst. 1539).

1514 *Finney, D. J. Isoplethic equilibria in polymorphic species. (pp. 1239–40).*

In populations in which randomness of mating is restricted by incompatibility mechanisms, the phenotypic frequencies often tend to equality after many generations even though the genotypic frequencies may have no simple properties. Such a condition is termed an isoplethic equilibrium. It is thought likely that if the incompatibility of an s-morphic system is regulated by g alleles, equilibrium will be isoplethic unless $g < s$.

1515 *Owen, A. R. G. Balanced polymorphism of a multiple allelic series. (pp. 1240–41).*

If the relative genotypic viabilities of the homozygotes and heterozygotes of three alleles are set out in a 3 x 3 matrix, then a state of balanced polymorphism will exist if the three leading determinants be negative and the entire determinant be positive.

1516 *Wilczynski, J. Some statistical premises to the quantum notion in genetics. (pp. 1241–46).*

The author amplifies his treatment of Mendelian heredity as a reduction of a single binomial expression (cf. *PBA*, XXIII, Abst. 9). An alternative representation makes use of the Pascal triangle. Various analogies between the expressions thus derived and formulae in quantum physics are pointed out.

1517 *Brewbaker, J. L. Gamete-fertile allopolyploids of* Trifolium repens *L. and* T. nigrescens *Viv. (p. 1247).*

Crosses between colchicine-induced tetraploids of *T. repens* ($2n = 32$) and *T. nigrescens* ($2n = 16$) gave hybrids with $2n = 48$ which were stoloniferous, had fertile gametes and were reciprocally cross sterile with the parents. Studies of meiosis and of genetic segregation suggest that a relatively high degree of homology exists between the eight *T. nigrescens* chromosomes and eight members of the *T. repens* genome, indicating that *T. nigrescens* may be one of the diploid progenitors of the natural amphidiploid *T. repens.*

1518 *Burnham, C. R., White, F. H. & Livers, R. Chromosome translocations in barley. (p. 1251).*

Cf. *PBA*, XXV, Abst. 1979.

The account of the excursions made by members of the Congress includes the following short surveys:—

1519 *De Philippis, A. Researches and experiments on forest tree genetics and forest seeds. (pp. 1258–59).*

Outlining work at the Institute of Sylviculture and Forest-seed Laboratory at Florence the author describes improvement of *Pinus pinea* with respect to yield of cones and turpentine by selection and subsequent crossing between the highest-yielding individuals, interspecific hybridization of *Pinus*, and physiological investigations on races of *P. pinaster.*

1520 *Morettini, A. Risultati di un ventennio di ricerche sulla costituzione di nuove varietà di frutta e ortaggi. (Results of twenty years of research on the constitution of new varieties of fruits and vegetables). (pp. 1259–62).*

Fruit and vegetable breeding carried out by the Centre for Studies on breeding fruits and vegetables at Florence during the last 20 years is reviewed.

1521 Thomas, P. T.
Irradiation for plant improvement.
Discovery 1957 : **18** : 18–20.

A popular account of the induction of economically useful mutants in crop plants by X and γ radiation in various countries is given. Another development referred to is the use of ionizing radiation in overcoming difficulties in crossing wild and cultivated forms. It is mentioned that encouraging results have been obtained in the Department of Agricultural Botany, Aberystwyth, Wales, where γ radiation of pollen has been effective in breaking down barriers to crossing, particularly between grass species.

1522 EBERT, M. & HOWARD, A.
Progress in radiobiology: conference in Stockholm.
Nature, Lond. 1956 : **178** : 842–43.

An account is given of the Fifth International Conference on Radiobiology held in Stockholm during August 1956. Under the chairmanship of Å. Gustaffson, one session was devoted to a discussion of the application of the mutagenic effects of radiation to plant breeding. H. J. Curtis described facilities and techniques at the Brookhaven Laboratory. A. R. Gopal-Ayengar outlined plans for work on rice in India. M. Zacharias reported that out of 427 radiation-induced mutations in soya bean, only 1% appeared to be of some economic value. According to R. Bauer, selection of mutant shoots from irradiated cuttings of black currant had given promising results. D. von Wettstein reviewed the work of Swedish investigators on directed mutations produced in barley by various physical and chemical agents.

1523 SCHWANITZ, F.
Die Bedeutung der experimentellen Mutationszüchtung für die Steigerung der Qualität von Nahrungspflanzen. (**The importance of breeding by means of experimental mutation in increasing the quality of food plants**).
Landw. Forsch. 1956 : 8. Sonderheft : 19–24.

A synopsis of the main factors affecting quality in horticultural and agricultural crop plants is given with reference to the advances achieved in this field by the use of artificially-induced mutations and polyploidy.

1524 BANGA, O.
International Conference on the Standardization and the Naming of Vegetable varieties at Wageningen, Netherlands, on August 27, 1955.
Euphytica, Wageningen 1956 : **5** : 130–38

The second day of the above conference (cf. *PBA*, XXVI, Abst. 3839) was devoted to reports and discussions on the definition and use of the term variety. It was concluded that the term should be applied only to an identifiable unit distinguishable from other material by clearly contrasting and stable differences. With regard to nonidentifiable units of agricultural use it was suggested that: simple selections within a variety should bear the name of the variety together with a trade name or the breeder's name; a highly improved selection should carry the name of the variety together with another name; and hybrids should have a distinct name.

1525 DERICK, R. A., HANNAH, A. E. & MCGREGOR, W. G.
Recent new varieties of cereal crops.
Agric. Inst. Rev. 1956 : **11** : No. 6 : 17–19, 24.

Varieties of oats, barley, rye, fibre flax and field bean recently licensed in Canada are described. Some of the varieties were developed in Canada, others are introductions.

1526 FUNKE, C.
Vergleichende morphologische und physiologische Untersuchungen am Pollen diploider und autotetraploider Kulturpflanzen. (**Comparative morphological and physiological studies on the pollen of diploid and autotetraploid crop plants**).
Z. Pflanzenz. 1956 : **36** : 165–96.

The pollen of tetraploid forms of *Trifolium pratense*, *T. hybridum*, *T. incarnatum*, *Ornithopus sativus* and *Medicago lupulina* obtained by colchicine treatment was compared with the pollen of the initial diploids. The mature tetraploid pollen grains were larger than the diploid and could be readily distinguished by counting the number of pollen pores (cf. *PBA*, XXVI, Abst. 2001). The germinability of the diploid pollen was considerably inferior to that of the haploid and in some cases multiple pollen tubes and branched pollen tubes were observed. Number of pollen pores and tendency towards producing multiple pollen tubes or branched pollen tubes appeared to be genetically determined. Experiments with tetraploid *Secale cereale*, *Festuca pratensis* and *Lolium perenne* showed that the method of determining tetraploidy described in *PBA*, XXVI, Abst. 2001 is not applicable to the Gramineae; it may, however, be employed with dicotyledonous species.

1527 MIRJUTA, JU. P.
(**The question of directing sex inheritance of a plant progeny**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **59** : 1179–81. [Russian].

The genetics of sex in *Cannabis sativus*, *Ricinus communis* and *Spinacia oleracea* is described. In the progeny of *C. sativus*, ♂ was dominant to ♀ and the latter to monecious; in *R. communis*, the monecious type was dominant to ♂ and ♀ and in *S. oleracea* ♂ to monecious and this to ♀.

By subjecting *C. sativus* ♀ to photoperiods of 10–12 hours, some plants were induced to develop ♂ flowers. This was ascribed to alteration of the order of dominance with the result that monecious plants became dominant to ♀. This explanation is supported by the following evidence; (1) when plants bearing ♀ flowers even after photoperiodic treatment were fertilized by those with reversed sex they often gave exclusively ♀ progeny; and (2) selfing the altered plants gave about ¼ monecious segregates and the rest ♀. It is concluded that, contrary to what has been supposed, some ♀ plants of *Cannabis* may be heterozygous, giving rise to both monecious and ♀ gametes. By crossing homozygous ♀ plants with homozygous monecious plants it should be possible to produce a line consisting of all ♀ plants when grown in normal day length. In *Spinacia*, where ♀ plants are recessive, monecious plants occur frequently and in *Ricinus*, where monecious plants are dominant, they are in the majority. The experiments indicate that in all three genera sex determination is multifactorial and both ♂ and ♀ plants may be heterozygous in varying degrees. It should therefore be possible to produce progenies with various ratios of ♂ and ♀ in addition to the usual 1 : 1, in all possible combinations from 1 : 0 to 0 : 1, or 2 : 0 to 0 : 2. In addition to the all-♀ progeny of *Cannabis*, all-♂ progenies have been obtained by chance in *Cannabis* and *Spinacia* and work is now in progress on producing ♂ homozygous plants which in crosses with ♀ homozygotes will give rise to exclusively ♂ progenies.

1528 Avratoščuková, N., Ferjančíková, V., Křivská-Šveřepová, G., Nováková, Z. & Řezníčková, E.
Příspěvek k řešení otázky bipaternity u rostlin. (**A contribution to the study of the problem of bipaternity in plants**).
Preslia 1956 : **28** : 250–61.

Experiments on multiparental pollination of barley, cabbage, tomato, *Phaseolus* and peas are reported from Prague. In separate experiments with each crop, a variety with two recessive characters was used as ♀ parent and was fertilized by mixed pollen of two other varieties, each being dominant with regard to one of the recessives of the ♀ parent. Analyses of the F_1 showed that none of the progeny possessed the characters of both pollen parents. Instances of hybrids which combine the characters of two pollen parents reported by some Soviet writers are regarded as rare phenomena and attributed to mutation.

1529 Funk, C. R. (Jun.).
Salt tolerance studies of selected crop plants.
Abstracts of Theses. Monogr. Ser. Utah St. agric. Coll. 1956 : **4** : No. **4** : p. 18.

The results of tests of cereals and forage grasses and legumes in artificially salinized field basins and naturally saline soils included the observation that large varietal differences in tolerance existed in birdsfoot trefoil, tall fescue and reed canary grass (*Phalaris arundinacea*), scope for selection and breeding thus being offered. Differences in the tolerance of birdsfoot-trefoil varieties were related to the geographical origin of the varieties.

Pflanzenschutzkongress, Berlin, 11. bis 16. Juli 1955. Kongressbericht. (**Plant Protection Congress, Berlin, 11-16 July 1955. Report of the Congress**). Dtsch. Akad. LandwWiss. Berlin 1956 : Pp. 256.

1530 *Buhr, H. Probleme der Kartoffelkäferresistenzzüchtung. (Problems in breeding for resistance to Colorado beetle). (pp. 105–30).*

After reviewing the literature on the host plants of the Colorado beetle, varietal differences among potatoes in susceptibility to the beetle, attempts to incorporate resistance into cultivated varieties by means of hybridization with wild species and the biochemical basis of resistance, the author presents the results of his own experiments. It was shown that the amount of demissin and other alkaloids present in the potato leaf has a considerable effect upon the appetite and fertility of the Colorado beetle and that the amount of such substances present varies according to variety and species. Selection for reduced susceptibility among cultivated varieties, combined with hybridization with wild species, should prove feasible; in addition, it may be possible to increase alkaloid content by polyploidization.

1531 *Blumer, S. Alte und neue Probleme der Mehltauforschung. (Old and new problems in mildew research). (pp. 161–68).*

A review is given of research over the past sixty years on *Erysiphe* spp., *Peronospora* spp. and *Podosphaera leucotricha*. Methods of control and the occurrence of new physiological races of these fungi are discussed.

1532 *Săvulescu, T. Zur Biologie und Systematik der* Tilletia-*Arten, die den Steinbrand des Weizens verursachen. (On the biology and systematics of the* Tilletia *species which cause bunt in wheat). (pp. 167–82).*

Criteria by which *T. foetida*, *T. intermedia*, *T.*

triticoides, *T. tritici* and *T. nanifica* may be distinguished from each other on the basis of the morphology of their spores are discussed and the distribution of these species in Rumania is sketched, together with a note on the occurrence of physiological races.

1533 Žukovskiĭ, P. M.
(The importance of the world collections of the USSR Institute of Plant Industry to general and special problems in breeding).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 161–71. [Russian].

The work of the institute on introduction and acclimatization of plant material from Soviet territories, Asia, Europe, Africa and America is discussed in relation to breeding improved varieties of wheat, rye, maize, potato, pome and stone fruits and other crops of economic importance. The report refers to such breeding techniques as distant hybridization, polyploidy, the use of pollen mixtures and production of heterotic hybrids.

1534 L'hiver 1955–1956. Ses douloureuses conséquences pour les cultures de Suisse romande. **(The winter of 1955-56. Its unfortunate consequences for crops in French-speaking Switzerland).**
Rev. rom. Agric. 1956 : No. 11 : 93–112.

Varietal differences are noted in the resistance of cereals, leguminous forage plants, forage grasses, grape vines and fruit trees to frosts in the severe winter of 1955–56.

1535 Braak, J. P. & Smeets, L.
The phytotron of the Institute of Horticultural Plant Breeding at Wageningen, Netherlands.
Euphytica, Wageningen 1956 : **5** : 205–17; Meded. Inst. Vered. TuinbGewass 1956 : No. 87.

An illustrated account is presented of the layout of the rooms and glasshouses of the phytotron at the above institute and of the efficiency of the equipment allowing control of temperature, humidity and duration and intensity of light.

CEREALS

1536 Palmer, J. D.
From trial grounds to farm.
Milns Seeds : Spring 1957 : 31–32.

Progress in cereal breeding by Miln & Co., Chester, England, is outlined. Mention is made of the following promising new material: in winter wheat, Cappelle x (Atle x Holdfast), Cappelle x Holdfast, (N59 x Yeoman) x Cappelle and 9/3/1 (Holdfast x Jubilegem); in spring wheat, 4/52 (Jubilegem x Atle); in spring oats, 8/30/13 (Sun x Star) and 19/12/2 (New Minor x Onward); and in barley, Spratt Archer x Carlsberg and Spratt Archer x Herta. Attention is also drawn to the spring oat Deva (cf. Abst. 1652).

1537 Oltmann, W.
Die Erhöhung der deutschen Getreideernten durch Züchtung und Sortenwahl, besonders beim Hafer. **(Increasing German cereal harvests by breeding and varietal selection, with special reference to oats).**
Saatgutwirtschaft 1956 : **8** : 309–10.

In the opinion of the author there are no valid reasons for assuming that any limits which may exist to breeding for increased yields in cereals have yet been reached; apart from direct breeding for increased yield, breeding for other factors such as greater resistance to diseases, lodging, shattering and drought will result in an increase in the actual amount of grain harvested. Oats have been comparatively neglected by the cereal breeder but in recent trials two new varieties, Peragold and Vollbringer, gave yields considerably higher than those of the standards with which they were compared.

Tien-jarenplan voor graanonderzoek. Verslag over het 2de jaar 1955. **(Ten-year plan for research on cereals. Report for the second year, 1955).**
Nederlands Graan-Centrum, Wageningen : Pp. 110.

1538 *Dantuma, G. Verslag over kruisingsprogramma en klimaatresistentie-onderzoek. (Report on the hybridization programme and research on resistance to climatic conditions). (pp. 11–18).*

Wheat. In breeding for resistance to *Puccinia glumarum*, the resistance of the spring varieties Thatcher, Frontana, CI12833 and Selkirk was successfully transferred to the progenies of crosses of these varieties with susceptible winter wheats. High yields were obtained from hybrids between American and Dutch spring varieties on the one hand and Italian spring wheats on the other. Breeding for resistance to frost and improved baking quality was also undertaken.
Oats. The response of a number of varieties to different day lengths was investigated.
Barley. The principal objectives of the breeding programme are suitability for sandy soils,

resistance to cold and diseases and tolerance of soil acidity. Crosses between *Hordeum spontaneum* var. *nigrum* and a number of spring barleys in an attempt to incorporate genes for resistance to *Erysiphe graminis* into the cultivated barleys proved successful but resistance to mildew in the offspring appeared to be linked with susceptibility to *P. glumarum*. A number of American varieties proved highly resistant to *Ustilago hordei* and have been crossed with susceptible Dutch varieties. The Swedish varieties Vega and Stella and the Finnish variety Halikko were shown to be relatively tolerant of soils with a high acid content. Some of the progenies of crosses involving Herta, Piroline, Rika, Haisa, Balder and Agis have given good results both on heavy and light soils.

1539 *Belderok, B., Bertram, G. L., Kouwen, W. C., Slim, T. & Wiebols, W. H. G. Methodiek bakwaarde-onderzoek van kleine monsters tarwe.* (*Methodology of research on the baking quality of small samples of wheat*). (*pp. 19–32*).

Different techniques employed at the Central Institute for Research on Nutrition, Wageningen, in evaluating the baking quality of microsamples of flour are described and compared.

1540 *Ferwerda, F. P. Vermeerdering van rogge-inteeltstammen in verband met onderzoek naar verbetering van rogge als veevoeder.* (*Propagation of inbred lines of rye in association with research on the improvement of rye as cattle fodder*). (*pp. 65–68*).

Progress at Wageningen in developing inbred lines of rye with a view to exploiting heterosis in F_1 crosses between them is reviewed briefly (cf. *PBA*, XXI, Abst. 1803).

1541 *Becker, G. J. F. Onderzoek naar de afrijpingsziekten van tarwe.* (*Research into ripening-off diseases of wheat*). (*pp. 87–96*).

Varietal differences in susceptibility to *Septoria nodorum*, *Fusarium* spp., *Erysiphe graminis* and *Helminthosporium sativum* are noted.

1542 *Broekhuizen, S. Het gele-roestprobleem in 1955.* (*The yellow rust problem in 1955*). (*pp. 97–110*).

Varietal differences in the susceptibility of a number of wheat varieties to different races of *Puccinia glumarum* are noted. In 1955, race 54 was the most prevalent race found in the Netherlands. Race 7 (cf. *PBA*, XXV, Abst. 1890) was not found in 1955.

1543 Ziraat Vekâleti Zirai Araştlrma Enstitüsü, Ankara. Senelik Rapor 1952/53. **(Institute for Agricultural Research, Ministry of Agriculture, Ankara. Annual Report 1952/53)** : 1954 : Pp. 115 + 31.

Wheat. In trials during the past four years some of the *Triticum vulgare* wheats developed by hybridization have outyielded the control variety 111/33 (*T. compactum*) and proved to be satisfactory as regards quality but susceptible to lodging, rusts and bunt. Although as yet insufficiently tested, the new varieties M2–B–49, M2–C/49 and M–13/49 are more promising; they have shown resistance to lodging and stripe rust and superiority over 111/33 in yield and baking quality. Most of the new wheats so far developed are however white-grained and therefore unsuitable for the foreign market; more attention is accordingly being given to hard red wheats. Crosses were effected between varieties developed at the Institute and foreign varieties such as Gabo, Westar, Wasatch and Heine's VII. A group isolator was employed, containing 15–20 emasculated heads and tubes holding water in which were placed the cut stems bearing the ears of the ♂ parent; seed set obtained by use of this device, which rendered hand pollination unnecessary, ranged from 38·4 to 90%. Work is also being carried out to obtain improved varieties of *T. durum* suitable for autumn-sowing in central Anatolia.

Descriptions are given of the varieties so far distributed: 111/33, already referred to; the *T. vulgare* wheats 220/39 (selected from a local variety) and m039/44 (Mentana x Delfi 89/28); and the *T. durum* wheats Akbaşak 073/44 [White Ear 073/44] which was selected from var. *leucurum* 'Akbaşak 253/29', and selections 173/39 and 0414/44 of local wheat belonging to var. *hordeiforme*.

Barley. Breeding to develop a variety with better brewing quality than the two-rowed winter barley Tokak 157/37 is in progress. Varieties developed from Tokak x Hanna have proved to be high yielding but suitable only as fodder barleys.

Other cereals. Oat varieties have failed to be winter hardy in central Anatolia. Breeding of early-maturing spring oats may therefore have to be considered, especially in view of the system of crop rotation now being introduced.

Tests of millets and grain sorghum in central Anatolia provided further evidence that early varieties of grain sorghum outyield late ones. Early varieties of *Panicum miliaceum* produce good yields in favourable seasons.

1544 **Cereal news from Canada.**
Cereal News 1956 : **2** : No. 6 : 9–19.

Wheat. A family of F_6 lines of winter wheat tested for reaction to race 16 of *Tilletia caries* and to *T. controversa* contained 44 lines which showed either complete resistance or only a trace of infection by either fungus; 47 lines were resistant to *T. caries*, four lines were resistant to *T. controversa* and the remaining 113 lines were susceptible to both fungi.

Barley. Only one of 424 Manchurian barleys from the Canadian world collection inoculated with *Ustilago nuda* showed no infection, three were resistant and two moderately resistant.

1545 **Handbook of Canadian cereal varieties 1956** : unpaginated.

The following varieties have been added to the list of those included in the *Handbook of Canadian cereal varieties of barley, field beans, flax, oats, spring wheat and winter wheat* (cf. *PBA*, XXII, p. 469): the barleys Herta (cf. *PBA*, XIX, Abst. 1791), Hudson (cf. *PBA*, XXIV, Abst. 330) and Parkland (cf. *PBA*, XXVI, Abst. 2326); the bean Lapin, which has good baking quality and is expected to be useful in the dry-bean packaging trade; the oat Clintland, developed in Indiana from Clinton x Landhafer back-crossed four times to Clinton (cf. *PBA*, XXIV, Abst. 273); and the oat Vicar (cf. Abst. 1658). Descriptions of these varieties are available in leaflet form for insertion in the handbook. The bean Lapin was introduced from Russia into New Hampshire at the beginning of the century. Vicar was developed at the Cereal Breeding Laboratory, Winnipeg, from a hulless plant of Garry [Victoria x (Hajira x Banner) x Victory] and was licensed in 1956. The variety is resistant to Victoria blight, all races of stem rust and many races of crown rust, and moderately resistant to smut and halo blight. Late-maturing and resistant to lodging, it has high protein and fat content. Revised descriptions of a number of cereal varieties are also available.

1546 **Seed bulletin. Spring-sown cereals.**
IVRO, Wageningen 1956 : Pp. 17.

Descriptions, based upon the Thirty-first descriptive list of agricultural crop plants (cf. *PBA*, XXVI, p. 701), are given for the principal varieties of spring wheat, oats, barley and rye recommended for cultivation in the Netherlands in 1956.

1547 **Seed bulletin. Winter-sown cereals.**
IVRO, Wageningen 1956 : Pp. 11.

The main winter varieties of wheat, rye and barley recommended for cultivation in the Netherlands in 1956 are described.

1548 Hjelmqvist, H.
Die älteste Geschichte der Kulturpflanzen in Schweden. (**The prehistory of cultivated plants in Sweden**).
Op. bot., Lund 1955 : **1** : No. 3 : 1–186.

A survey of cereal grains and weed seeds found as impressions in Neolithic to Iron Age Sweden is presented. A naked, probably four-rowed, barley appears to have been the commonest early Neolithic cereal but was superseded in the Bronze Age by four-rowed and six-rowed hulled barley. The earliest abundant wheats were *Triticum monococcum* and *T. dicoccum* but Neolithic impressions of *T. compactum* and *T. spelta* were also observed. Oats first occur among the Bronze Age finds and rye among Iron Age material.

1549 Bilquez, A.-F.
Étude de la valeur agronomique des différentes sortes de variations héréditaires. (**Study of the agronomic value of different kinds of hereditary variations**).
J. Agric. trop. Bot. appl. 1956 : **3** : 200–06.

The terms autoploidy and alloploidy are explained and the value of artificially-induced polyploids is discussed with special reference to cereal breeding.

1550 Wells, D. G. & Caffey, H. R.
Scissor emasculation of wheat and barley.
Agron. J. 1956 : **48** : 496–99.

Clipping the florets at a level such that the tips of the anthers were cut away proved to be a rapid and effective method of emasculating wheat or barley if carried out a few days before dehiscence would normally occur. Heads emasculated thus gave good seed sets after bulk pollination but when the florets were cut so that most or all of each anther was removed seed set failed in wheat although remaining good in barley.

1551 Chirilei. H.
Starea protoplasmei celulelor cerealelor de toamnă în timpul iernării. (**The state of the protoplasm of winter cereals during the winter**).
Bul. Şti. Secţ. Şti. agric. Secţ. Geol. Geogr. 1955 : **7** : 845–58.

The investigations referred to in *PBA*, XXVI, Abst. 2223 were extended to 16 varieties of wheat, 3 ryes and 1 barley. As before, a correlation between winter hardiness and the withdrawal of the protoplasm from the cell walls was observed.

1552 Batts, C. C. V.
Testing new cereal varieties for disease resistance.
Agric. Rev., London 1956 : **2** : 18–22.

A short account is presented of the work carried out by the Mycology Department of the National Institute of Agricultural Botany, Cambridge, England, to determine the reaction of varieties to diseases, particular attention being given to yellow rust and loose smut and their races on wheat and barley.

WHEAT

1553 Larter, E. N. & Elliott, F. C.
An evaluation of different ionizing radiations for possible use in the genetic transfer of bunt resistance from Agropyron to wheat.
Canad. J. Bot. 1956 : **34** : 817–23.

A study has been made of the effectiveness of various dosages of X rays, thermal neutrons, P^{32} and S^{35} in causing translocations in a cross between SH–191 [*Triticum* sp. ($2n = 56$) x *Agropyron* sp.] ♀ and *T. compactum* ($2n = 42$) ♂ and data are provided on the percentage survival and fertility of treated and untreated F_1 plants. Pollen mother cells were examined for chromosome associations and the resulting analysis of pairing relationships is tabulated. In the case of plants treated with thermal neutrons, increased exchange frequency was found with increased dosage while the percentage survival remained equal to that of untreated control plants. Increased dosages in the case of the other treatments resulted in decreased survival and lower frequency of detectable chromosome interchanges. It is hoped that it may prove possible to transfer resistance to *Tilletia* spp. from *Agropyron* to wheat by means of radiation induced translocations.

1554 Swaminathan, M. S. & Natarajan, A. T.
Fast neutron radiation and localised chromosome breakage.
Curr. Sci. 1956 : **25** : 279–81.

Observations have been made on the effect of three-hour irradiations with fast neutrons on mitosis in root-tip cells of *Triticum monococcum* (Japanese Early), using a pair of chromosomes with satellites as markers. Cytological aberrations, including chromosome breakage, interchanges, bridge formation, fragment formation and stickiness were seen in treated material. From the number and position of breaks observed it is concluded that the region near the supernumerary constriction of Sat II is preferentially disposed to breakage by fast neutron radiation and that this localized breakage is confined to only one chromosome of the Sat II pair. No evidence for localized preferential susceptibility to breakage was found in any chromosome when β radiation from P^{32} was employed, nor did cold treatment show the presence of any heterochromatic segment in the region where breakage frequently occurs. These results are discussed with reference to other work where similar results were obtained (cf. *PBA*, XXIV, Abst. 487, XXV, Abst. 2490 and XXVI, Abst. 3278).

1555 Arnason, T. J.
Maternal inheritance of leaf variegation in hexaploid wheat.
Canad. J. Bot. 1956 : **34** : 801–04.

A plant having yellow-green stripes on the leaves was found among the progeny of a plant of *Triticum vulgare* which had been treated with P^{32}. On selfing, this variegated plant gave some green and some variegated offspring. In a cross with a bearded mutant of Thatcher the awn character segregated in a simple Mendelian manner but variegation appeared only in plants whose maternal parent was variegated. Cytological investigations have failed to provide evidence of any aberrant chromosome condition and it is suggested that variegation is caused by mutant plastids in the egg becoming distributed to various regions of the leaf during development.

1556 Burrell, W. D.
Winter wheat variety trials: 1950-54.
J. nat. Inst. agric. Bot. 1956 : **7** : 495–509.

Details are given and discussed of trials of 18 autumn-sown wheat varieties at 19 localities in England during the years 1949–50 to 1953–54 inclusive. Data are provided on grain yields, straw length and time of ripening compared with the control varieties Bersée and Juliana, and with varieties in previous trials in the same series (cf. *PBA*, XXV, Absts. 1832 and 1833). Cappelle Desprez, Minister and Glasnevin Rosa were superior to Bersée, and Demeter and Eclipse to Juliana at all centres and Alpha at northern centres.

1557 Bullen, E. R., Dadd, C. V. & Fiddian, W. E. H.
N.A.A.S./N.I.A.B. trials of winter wheat varieties: 1953-54.
J. nat. Inst. agric. Bot. 1956 : **7** : 510–24.

The trials reported here form a continuation of those reported in *PBA*, XXVI, Abst. 1120, with some changes in the varieties included. Data on grain yield and field characters are provided for 1953 and 1954 and discussed in relation to external factors such as locality and climatic conditions.

1558 Rassenlijst voor landbouwgewassen 1957. **(Variety list of agricultural plants, 1957).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **13** : p. 53.

Brief data on the yield, quality of grain and straw, maturity, resistance to disease, soil requirements and degree of winter hardiness are presented for the winter wheats Merlin (= Heine 51), Albatros (= Heine 60) and Dippe's Triumph. Merlin is a high-yielding, red-grained variety with long, moderately stiff straw. It is extremely winter hardy but is susceptible to yellow rust. Dippe's Triumph, also a red-grained variety with moderately stiff straw, is resistant to yellow rust but does not give such high yields as Merlin. Albatros, a white-grained variety with long moderately stiff straw, gives high yields of large grains and is resistant to yellow rust. Particulars of the breeders and seed producers of these varieties, all of which are of German origin, and are included in the official Netherlands list of approved varieties for 1957, are also given.

1559 QUAGLIOTTI, F.
Dragone.
Sementi elette 1956 : **2** : No. 7 : p. 59.

The soft winter wheat Dragone [Dragoon] is described as early, resistant to lodging, rusts and cold and gives good yields even in soils of low fertility. It is a hybrid of Autonomia x Aquila.

1560 FAVERO, A.
Il grano "S13". **(The wheat S13).**
Sementi elette 1956 : **2** : No. 7 : 66–67.

The wheat described, a hybrid between the Japanese variety Wase Nibay [Early Double] and the South African Sterling B, is highly resistant to shedding and mildew and resistant to rusts, cold and lodging, being hence suitable for cultivation on high ground.

1561 DI SCALEA, R.
Nazareno Strampelli.
Agricoltura, Roma 1956 : **5** : No. 7 : 54–57.

In a picture of the Italian wheat breeder and his work it is shown how the yield of grain has been doubled by the use of his varieties, some of which are enumerated.

1562 BALLATORE, G. P.
Prova triennale di confronto di cultivar di frumenti teneri e duri in Sicilia. **(A three years' comparative test of cultivars of soft and hard wheats in Sicily).**
Ann. Sper. agr. 1956 : **10** : 1971–2005.

In comparisons of the ancient wheats of Sicily with improved varieties of bread wheat and *Triticum durum*, the ancient Sicilian soft wheat Coccitta consistently exceeded all others in yield of grain and straw in the plains. The bread wheats introduced from central or northern Italy were all outyielded by improved hard wheats such as Senatore Cappelli, Aziziah 302, Russello SG7 and Garigliano; this latter group outyielded all others, including Coccitta, on high ground, where the best yields of all were given by Russello SG7.

1563 PANÉ MERCÉ, J.
Un nuevo trigo que se difunde: el Pané 3. **(A new wheat which is spreading: Pané 3).**
Agricultura, Madr. 1956 : **25** : 83–85.

The wheat referred to is a selection from the cross Hybrid 2–4 x Mentana and is described as a winter wheat, belonging to the species *Triticum vulgare*, possessed of frost resistance, good standing capacity, high baking quality and unusual yielding ability, having produced between 4000 and 5000 kg. of grain per ha. in a number of tests.

1564 PRUCKOVA, M. G. & GURČENKO, V.
(New wheat varieties).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 2 : 36–43. [Russian].

Recent Soviet wheat standards are described. The Ukrainian material includes the winter wheats Bezostaja 4 [Awnless 4], Skorospelka 3b [Early 3b] (cf. *PBA*, XXVI, Abst. 3193) and Belaja Cerkovj 198, from Erythrospermum 15 x Covelle. The latter is characterized by large grain and productive tillering; it outyields Lutescens 17 and other older standards in the woody steppe.

The following deserve mention among the new spring wheats. Tulun 197 was obtained at the Tulun Breeding Station by hybridization involving *Triticum dicoccum* and hard and soft wheats. In the Irkutsk province it outyields Lutescens 62 which it supersedes as a standard. It shows improved resistance to lodging and loose smut and has good baking and milling properties. Selenga was selected from local material in Burjat-Mongolia, where it outyields Garnet and other early-ripening spring wheats.

Its baking and milling properties are good. Onohoïskaja 4 (Reward x Lutescens 62) from the Onohoïskaja Breeding Station also outyields Lutescens 62 and does not lodge. The new Kazah standards, Kazahstan 126 (Lutescens 47 x Kože-Bidaĭ) and Slava [Glory], a hybrid between *T. vulgare* and *T. durum*, are distinguished by high yield, large grain and resistance to loose smut. Melanopus 26, the new standard for the Saratov province, was bred at Krasnyĭ Kut. It is a hard wheat notable for drought resistance and high quality of grain. Mention is also made of a number of other hard wheats made standards in various provinces. All of these show resistance to lodging and diseases and are good macaroni wheats.

1565 JURJEV, V. JA.
(Some questions concerning the method of breeding cereal crops).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 3 : 6–10. [Russian].

This article, dealing in general terms with wheat breeding, discusses such topics as breeding aims, hybridization, selection, agrobiological techniques, inheritance of acquired characters and the shortcomings of Soviet methods of varietal testing and certification of new varieties.

1566 GALLAY, R.
La sélection de nos blés. Voies anciennes et voies nouvelles. **(The breeding of our wheats. Old methods and new methods).**
Soixante-quinzième anniversaire de la Fédération des sociétés d'agriculture de la Suisse romande 1956 : 34–48; Publ. Sta. féd. Essais agric., Lausanne 1956 : No. 497 : 34–48.

This brief account of selection work on wheat at the Lausanne and Zürich-Oerlikon research stations traces the development of improved breeding methods in Switzerland during the past 50 years and gives information on the genealogy of the more important varieties at present grown there. Current breeding work at the two stations includes intensive studies on interspecific and intergeneric hybridization and the testing of varieties of foreign origin as to their suitability for cultivation under Swiss conditions.

1567 ABDUR RASHID KHAN & ATTA ULLAH KHAN, M.
Wheat improvement in the Punjab.
Agriculture, Pakistan 1956 : **7** : 140–47.

The history of wheat improvement in the Punjab since 1893 and work at present in progress are described. Wheat and barley nurseries are maintained at Lyallpur on behalf of FAO for observations on the incidence of rusts and bunts. Those varieties which have remained free from infection by *Puccinia glumarum*, *P. triticina*, *P. graminis* var. *tritici* and *Tilletia* sp. are listed. The following hybrids are being studied: *Triticum* sp. x *Secale* sp., *T. durum* x *T. vulgare* and *T. sphaerococcum* x *T. vulgare*. Intervarietal crosses have also been made, and the method of improvement being followed is outlined. Quality tests are carried out at the milling and baking laboratory and data are provided on the physical, chemical, milling and baking characteristics of the varieties C591, C228, C518 and C217.

1568 BRUYÈRE, R.
Une nouvelle variété de froment en Urundi. **(A new wheat variety in Urundi).**
Bull. INEAC 1956 : **5** : 185–92.

Line 130–1–37, a new high-yielding variety with large, long grains that produce a flour of moderately good baking quality, was developed at the Kisozi Experimental Station, Belgian Congo, from a cross between the local variety Sabanero and a variety from Njoro in Kenya. Adapted for cultivation in the Ruanda and Urundi regions of the Belgian Congo, it is highly resistant to lodging and rusts and represents a considerable advance in the breeding of wheat varieties suitable for this part of the Belgian Congo.

1569 GOULDEN, C. H.
Wheat breeding and production in Canada.
World Crops 1956 : **8** : 423–27.

The progress made in wheat breeding in Canada is discussed with reference to particular problems occurring in the different wheat-growing areas.

1570 **Racine winter wheat developed in Wisconsin.**
What's New Crops Soils 1956 : **9** : No. **3** : p. 34.

Racine, a soft red winter wheat, has been released by the University of Wisconsin. It is bearded and winter hardy and gives high yields. Compared with Blackhawk it is more resistant to *Ustilago tritici*, *Erysiphe graminis* and *Septoria* spp., less resistant to *Tilletia* spp. and has a similar reaction to *Puccinia graminis* var. *tritici* and *P. rubigo-vera* var. *tritici*. Its straw is of moderate strength and it matures about one day earlier than Blackhawk, producing softer-textured kernels with a lower protein content.

1571 **Omar looks good in disease tests.**
What's New Crops Soils 1956 : **9** : No. 3 : p. 21.

Good resistance to smut has been shown by a new soft white winter wheat variety, Omar, in tests at Washington State College. No infection developed under artificial inoculation with all known races while in the same test Elmar showed 62% infection.

1572 COTTIER, K.
Recent research work. Cereal trials.
NZ J. Agric. 1956 : **93** : p. 15.

This short account of varietal trials of wheat, oats and barley in New Zealand includes information on the new wheats Arawa (cf. *PBA*, XXVI, Abst. 1084), expected to replace Dreadnought, and selection 313,01 which has consistently outyielded Cross 7 in both autumn and spring-grown trials. Wheat 313,01 is suitable for header harvesting and similar to Cross 7 in resistance to lodging and time of maturity but inferior to it in baking quality. Some reselections which appear to have satisfactory baking quality have however been obtained and are to be tested agronomically.

1573 ALLEN, G. H. & GEORGE, R. W.
Wheat investigations at Biloela Regional Experiment Station, Central Queensland.
Qd. J. agric. Sci. 1956 : **13** : 19–46.

Since 1948, 20 varieties have been tested to find those suited to conditions in the Callide Valley region and the performance of some of these varieties is described.

1574 MACINDOE, S. L.
Wheat-farming developments in Australia.
World Crops 1956 : **8** : 428–33.

A brief survey of all aspects of wheat growing in Australia is given, including the progress made in breeding for yield, disease resistance, baking quality and cold resistance.

1575 BONVICINI, M.
Contributo allo studio dei grani duri. (**Contribution to the study of hard wheats**).
Sementi elette 1956 : **2** : No. 7 : 17–25.

The older varieties of *Triticum durum* such as Cappelli are no longer capable of responding to the improvements in fertility that are being effected in southern Italy and the reasons are explained why they cannot be replaced by bread wheats for the manufacture of macaroni products. A study of large numbers of varieties, Italian and introduced, of *T. durum* has shown many of them to be synonymous; most of them are inferior to Cappelli in yield and those that exceed it are generally inferior in quality. A certain number of hybrids in the early generations show some promise and are being subjected to further study.

1576 **Report progress in breeding of semi-dwarf winter wheat.**
What's New Crops Soils 1956 : **9** : No. 3 : p. 22.

Progress is reported in the development of semi-dwarf winter wheat at Pullman, Washington. Several selections from Norin 10 [Ministry of Agriculture and Forestry 10] x Brevor have given higher grain yields but lower straw yields than Elmar and Brevor.

1577 KHAN, A. R.
Inheritance of some spike and grain characters in wheat in the Punjab.
Agriculture, Pakistan 1956 : **7** : 47–59.

The following conclusions were reached from studies of the progeny of crosses involving T22, C217, Ford, T28, C591, Sword, C518 and C250. Glume pubescence, glume colour, awn colour and grain colour are all monogenically determined and there is no linkage between glume colour and pubescence; awn size is determined by three complementary gene pairs. Segregation into five different classes for awn size was found in the F_2 progeny of crosses between awned and awnless varieties, viz. Ford x C591 and T22 x C217. On the basis of (1) the suggestion that three complementary gene pairs are involved in the expression of this character and (2) the observed F_3 segregations from the various classes, the possible genotypic constitution of plants in each of these classes has been worked out.

1578 COPP, L. G. L. & LOBB, W. R.
Arawa, a new wheat to replace Dreadnought.
NZ J. Agric. 1956 : **93** : 221–25.

Arawa is described in detail (cf. *PBA*, XXVI, Abst. 1084). Its parentage involves six varieties: Tuscan, "a high-quality wheat from India", Dreadnought, Kenya 744, Federation and Cross 7. In addition to the advantages already referred to, it is superior to Dreadnought in loose-smut resistance and milling and baking quality. It ripens 3–4 weeks earlier than Dreadnought and is almost as high in yielding ability. It is inferior to Dreadnought in mildew resistance.

1579 ENGLEDOW, F. L., BELL, G. D. H. & LUPTON, F. G. H.
A study of the value of repeated backcrossing of a pentaploid hybrid of *Triticum vulgare* (cult. var. Little Joss) and *T. turgidum* (cult. var. Rivett).
J. agric. Sci. 1956 : **48** : 250–57.

Typical *vulgare* and *turgidum* plants from successive generations of the cross *T. turgidum* 'Rivett' x *T. vulgare* 'Little Joss' were compared with plants from the successive generations obtained after back crossing parental types up to four times to the respective parents. In the backcross material ear characters became rapidly stabilized and straw height and time of maturity rather less quickly; the straight cross attained stability more slowly. Among the back crosses to *T. turgidum*, selections which consistently outyielded *T. turgidum* were derived from the most frequently back-crossed material, while among the *vulgare* types which outyielded *T. vulgare,* those from the straight cross gave higher yields than those from back crosses to *T. vulgare.* The earliness of Little Joss was readily combined with the mature plant morphology of Rivett. In an analysis of yield components in the parents and in the most promising selections there was no evidence that the components determining high yield in the parents were combined in the selections.

1580 KUČUMOV, P. V. & KOVALEVSKAJA, N. I.
(The adaptive character of the formation of hybrids in spring wheat).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 92–101. [Russian].

The dominance of characters in the hybrids of *Triticum durum* x *T. dicoccum* and *T. spelta* x *T. durum* was altered by environment in experiments conducted at Harjkov. The F_1 grown on rich soil gave a high percentage of *T. durum* types, while on poor soil most plants possessed the characteristics of *T. dicoccum* or *T. spelta* respectively. Generally speaking the F_1 raised on rich soil developed productive ears, and the brittle ear character among the progeny of the first mentioned hybrid and long awns of the other were suppressed. *T. durum* types trained for two generations on poor soil and then grown on rich soil showed no appreciable improvements in grain size, length of ear, number of spikelets and grains per ear. *T. spelta* x *T. durum* was characterized by extensive segregation in the F_2, which included cultivated types resembling *T. vulgare*, *T. polonicum* and *T. turgidum* and other forms resembling *T. dicoccum* and *T. monococcum.*

1581 KANIEWSKI, K.
The diversity of the plants of the "species" *Triticum polonicum* L. and their position in the evolutionary system of wheat.
Bull. Acad. polon. Sci. 1956 : **4** : 45–48.

A number of forms previously thought to pertain to *T. polonicum* were distinctive in spikelet morphology and anatomy and since, like *T. dicoccum* but unlike most *T. polonicum* forms, they gave *T. dicoccum* types among the progeny of crosses with *T. durum* and *T. spelta* types in crosses with *T. vulgare,* they are assigned to *T. polonicoides.* *T. polonicum* is regarded as having evolved from *T. durum.*

1582 NAKAJIMA, G.
A cytogenetical study on the intergeneric F_1 hybrid between *Triticum polonicum* and *Secale africanum.*
Cytologia, Tokyo 1955 : **20** : 273–79.

Four F_1 plants from *T. polonicum* ♀ ($2n = 28$) x *S. africanum* ♂ ($2n = 14$) surpassed both parents in culm and spike length and number of flowers per spikelet and were intermediate in other characters, tending to resemble the ♀ parent more closely. The modal metaphase I configuration was $0_{II} + 21_{I}$. Pollen fertility was low but flower structure favoured natural selfing, with the result that 1·48–2·60% seed was set. Seed was also obtained through pollination with the amphidiploid of *T. vulgare* x *S. cereale.*

1583 NAKAJIMA, G.
(Cytogenetical studies of the F_1 of *Triticum dicoccum* x *Secale Vavilovii*).
Ikengaku Zasshi/Jap. J. Genet. 1956 : **31** : 82–86. [Japanese].

One hybrid was obtained, resembling the wheat parent in most respects. The chromosome number was $2n = 21$, the modal meiotic configuration 21_{I}. Up to 4 bivalents were sometimes observed, probably through autosyndesis of the AB genomes. Sterility was high but a few grains resulted from natural selfing.

1584 MOLDENHAWER, K.
Badania nad mieszańcami, otrzymanymi z krzyżówki generatywnej pszenicy ♀ Białej Kleszczewskiej x ♂ *Agropyrum elongatum* Host., P.B. **(Studies of hybrids obtained from the sexual cross of the wheat ♀ White Kleszczewska x ♂ *A. elongatum* Host., P.B.).**
Acta agrobot., Warszawa 1954 : **2** : 39–68.

A collection of F_2 hybrids of the above cross, many of which had been lost at the beginning of the second world war, was back crossed to the maternal parent. The progeny obtained from the back cross segregated during successive years into plant types separable into four groups, one wheat-like, one approaching *Agropyron* in type and two intermediate. Chromosome numbers varied between $2n = 28$ and $2n = 88$, the most frequent number being $2n = 42$. Tables are provided showing the chief characters of a number of lines in each of the four groups.

1585 **Cereal news from Canada. University of Saskatchewan.**
Cereal News 1956 : **2** : No. **7** : p. 23.

Transference of the rust resistance of *Agropyron elongatum* to *Triticum vulgare* is mentioned. By back crossing, a type carrying the required chromosome of *Agropyron* was obtained. The gene for resistance was incorporated in a wheat chromosome by means of radiation-induced translocation of the region carrying the gene.

1586 PALAMARČUK, I. A.
(The sterility of the first generation of a wheat-*Elymus* hybrid).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **59** : 1341–44. [Russian].

Anomalies observed in the reproductive cells, such as formation of multinuclear pollen mother cells, degeneration of the archesporium or nucellus and irregular distribution of chromosomes at meiosis, were responsible for sterility of the F_1 of *Triticum vulgare* ♀ x *Elymus arenarius* ♂.

1587 MOLDENHAWER, K.
Badania nad wartością wypiekową niektórych linii krzyżówki ♀ *Triticum vulgare* Vill. x ♂ *Agropyrum elongatum* Host. **(Investigations on the baking quality of lines of the hybrid ♀ *T. vulgare* Vill. x ♂ *A. elongatum* Host.).**
Acta agrobot., Warszawa 1954 : **2** : 179–201.

Details are given of the morphological and physiological characters and of the baking quality, as determined by means of the Brabender farinograph, of seven stable wheat-like lines derived from a cross between the winter wheat *T. vulgare* 'Biała Kleszczewska' [White Kleszczewska] ♀ x *A. elongatum* ♂. Line 38/49 was best in elasticity and dough development but had the lowest gluten content.

1588 PISSAREV [PISAREV], V. E. & SHILKINA [ŽILKINA], M. D.
Application of boron in breeding.
Bot. Notiser 1956 : **109** : 405–10.

In pot and field experiments at the Institute of Grain Husbandry of the Nonchernozem Belt, USSR, foliar application of a solution of boric acid to the amphidiploid plants *Triticum timopheevi* x *T. monococcum*, AD74 (Moscow spring wheat x spring rye) and AD20/1, to the interamphidiploid hybrid IhAD and to the triple hybrid (*T. monococcum* x *T. persicum*) F_1 x *T. vulgare* resulted in a marked increase in numbers of spikelets and grains per ear compared with untreated controls (cf. Abst. 364). By annual selection in AD20/1 of the best ears resulting from boron treatment, average number of grains per spike was increased from 40·7 in 1952 to 54·5 in 1955. The quality of the grain was also improved by boron treatment.

1589 KOEDŽIKOV, H.
(An experiment on vegetative hybridization of wheat).
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1954 : **2** : 69–77. [Bulgarian].

The seed progeny of a vegetative hybrid of *Triticum vulgare*/*T. spelta* from Sofia showed changes with regard to leaf, culm and ear characteristics and gave segregates of a speltoid kind and of a soft wheat of another botanical variety than the soft-wheat parent. The latter segregate is distinguished by high yield and is regarded as valuable breeding material.

1590 MORRIS, G. P.
Descriptions of recommended varieties of wheat.
J. nat. Inst. agric. Bot. 1956 : **7** : 486–94.

Detailed descriptions are given of Banco (cf. *PBA*, XXIII, Abst. 1847), Peko (cf. *PBA*, XXVI, Abst. 3121), N.59 (cf. *PBA*, XXVI, Abst. 3121) and Svenno (cf. *PBA*, XXIV, Abst. 194).

1591 Zomertarwe, 1957. **(Spring wheat, 1957).**
Landbouwvoorlichting 13 : Bijl. 15; Ber. Rassenkeuze 1956 : No. 212: unpaginated.

Brief descriptions are given of four established varieties and five new varieties tested on different types of soil in the Netherlands in 1956.

1592 SWINBANK, J. C. & JOHNSON, V. A.
If you grow winter wheat choose the right variety.
Neb. Exp. Sta. quart. 1955 : **4** : No. **1** : 4–6.

Varieties are recommended for the various wheat-growing areas of Nebraska and the selected varieties described.

1593 Ufer, M.
Studien an afghanischen Weizen. I. Über die botanische Zusammensetzung der wichtigsten afghanischen Landweizen. (**Studies of Afghanistan wheats. I. On the botanical composition of the most important Afghanistan land races**).
Z. Pflanzenz. 1956 : **36** : 133–52.

A key to the identification of the different botanical varieties of *Triticum vulgare* and *T. compactum* found in Afghanistan is provided and the geographical distribution of each variety is indicated. Brief mention is also made of the occurrence of *T. turgidum*, *T. orientale* and *T. polonicum*. The author has attempted to simplify, on the basis of his own observations, the classification proposed by Vavilov and Bukinič in 1929. Many of the varieties recognized by the latter authors are considered to be merely forms of the main botanical varieties found in Afghanistan and in addition, the subgroup *breviaristatum* of *T. vulgare* has been included in the subgroup *aristatum*. No specimens of the subgroup *inflatum* of *T. vulgare* were discovered and it is thought that the plants classified under this heading by the Russian authors were forms stunted by either heat or disease. Considerable variability was found in all the botanical varieties and provenance types examined and intermediate forms were frequent. In general, the protein and gluten contents of the Afghanistan wheats were poor but all possessed a high degree of resistance to frost and some proved highly resistant to *Puccinia* spp.

1594 Schiemann, E.
Fünfzig Jahre *Triticum dicoccoides*. Aaronsohns Entdeckung des Wildemmer einst und jetzt. (**Fifty years of *T. dicoccoides*. Aaronsohn's discovery of wild Emmer then and now**).
Ber. dtsch. bot. Ges. 1956 : **69** : 309–22.

A review of research on *T. dicoccoides* since its discovery by Aaronsohn in 1906 is given and the systematic position of this species within the genus *Triticum* is discussed with reference to the literature on the history of cultivated wheat.

1595 Knott, D. R.
A case of somatic reduction in a premeiotic cell in wheat.
Canad. J. Bot. 1956 : **34** : 831–32.

A case of premeiotic somatic reduction was found in a plant obtained from the first back cross of Thatcher to a stable selection of Chinese Spring x *Agropyron elongatum* back-crossed to Chinese Spring. Of the 10 reduced cells found in a single anther, four had 22 chromosomes and five 20. In the remaining cell the number was not clearly countable. Pairing behaviour indicated that reduction had involved a random segregation of homologous chromosomes.

1596 Carrante, V. & Dionigi, A.
Prove orientative di granicoltura per la Puglia e Lucania (1954–55). [**Guiding tests of wheat growing in Apulia and Lucania (1954-55)**].
Ann. Sper. agr. 1956 : **10** : No. 5 : Suppl. : lix-lxxxiii.

Tests of wheats with different developmental rhythms showed that the so-called late-early types like Elia (cf. *PBA*, XXVI, Abst. 2222), which developed slowly in the early growth phases and quickly in the stage of maturation, gave the highest yields in southern Italy just as they have done in northern and central Italy, especially in areas subject to low temperatures in winter; however, in areas or years characterized by hot dry summers the varieties that develop quickly in both phases have the advantage, particularly when there is a risk of sudden spells of extreme heat; when this risk is absent the best yields may be obtained from early-late types that develop quickly in the early phase and slowly in the late. It is thought however that it will be ultimately possible to breed late-early forms suited to the conditions of southern Italy too.

1597 Kozlova, A. F.
(**An experiment on changing spring wheat into winter wheat**).
Agrobiologija (Agrobiology) 1956 : No. **3** : 65–68. [Russian].

This account of training spring wheats for the winter habit at Kuibyšev mentions a winter variety thus obtained from the spring wheat Lutescens 801. It has more productive tillers, a longer ear and more spikelets and grains per ear than the winter standard Uljjanovka, which it equals in hardiness.

1598 Maljuta, D. I.
(**Changing spring wheat into winter wheat**).
Agrobiologija (Agrobiology) 1956 : No. **3** : 69–70. [Russian].

At Ramonj a number of spring wheats changed into hardy winter wheats after sowing for several successive years as winter wheats. The winter forms segregated like sexual hybrids and many of these segregates were of different botanical varieties than the initial forms. In the case of *T. durum*, conversion into varieties *milturum* or *erythrospermum* of *T. vulgare* occurred. Among the winter forms of Lutescens 62 was a plant with two different ears: the one was awnless and resembled var. *lutescens*; the other was awnless on one side but bore awns 3–6 cm. long on the apical portion of the other. Five grains from the awnless portion of the ear gave rise to plants resembling var. *lutescens*, except that each of them bore rudimentary awns 0·5–4·0 cm. long. Among the plants that arose from the awned portion of the ear only one had awns; the others were awnless.

1599 OMAROV, D. S.
(The heritable basis of a few plants of the spring form which overwintered in the first year).
Agrobiologija (Agrobiology) 1956 : No. 3 : 35–49. [Russian].

The findings of experimenters at Leningrad on training spring wheats for the winter habit essentially agree with Lysenko's thesis that changes in habit occur on sowing spring forms in the autumn for several generations. But, contrary to the usual Mičurinist view, a few plants that had survived the first winter were found to be biologically and genetically the same as those that did not, their survival being attributed solely to microclimatic causes. After sowing the spring wheat Milturum 321 for three generations some winter types pertaining to the botanical variety *ferrugineum* were obtained. These surpassed the winter wheat Ukrainka in hardiness.

1600 FAĬNBRON, B. D.
(Changing nonoverwintering spring wheat into a hardy winter form as a method for producing initial breeding material).
Agrobiologija (Agrobiology) 1956 : No. 3 : 50–51. [Russian].

The spring wheats Milturum 321 and Moscow were changed into winter wheats by sowing in autumn for several generations at the Timirjazev Agricultural Academy. The succeeding generations of both spring wheats gave rise to winter forms that were of different botanical varieties from the original parents and showed variability with regard to economic characters. Among the progeny of Milturum 321, winter-hardy families, notable for early maturation, were selected. Forms selected from Moscow were distinguished by good baking quality, productive tillering, compact ears, high grain yield per ear, uniform earing and good stand. Some families produced up to 87·2% vitreous grain and had a higher gluten content than the winter-wheat standard Moscow 2453.

1601 YAMASAKI, M. & HANADA, K.
(The relation between adaptation to winter sowing in wheat and vitamin C content).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **24** : 310–13. [Japanese].

At low but not at high temperatures, the ascorbic acid content of the stems of six Japanese varieties was found to be positively correlated with relative suitability for winter sowing. Resistance of varieties to the toxic action of $KClO_3$ and relative suitability for winter sowing were found to be negatively correlated, irrespective of temperature.

1602 LYSENKO, O. T.
(Climatic conditions and the characteristics of the winter forms which arose from spring forms).
Agrobiologija (Agrobiology) 1956 : No. 3 : 71–76. [Russian].

An account of changing spring wheats into winter wheats is given and the effects of the climatic conditions under which the winter forms were obtained upon the biological and morphological characteristics of these forms are discussed. It was found that the winter forms obtained by training in Moscow were characterized by greater hardiness than those from Odessa. The winter forms from the arid districts of Odessa and Saratov provinces had narrower leaves than forms obtained from the same material in the Moscow and Kirov provinces.

1603 TURBIN, N. V. & VOLODIN, V. G.
(The problem of biology of flowering in wheat).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **107** : 601–03. [Russian].

Observations on some wheats in White Russia showed that all had some open florets at flowering and that a possibility of fertilization by foreign pollen existed. Varietal differences in percentages of open florets are noted.

1604 JANUŠKEVIČ, S. I.
(The results of pollinating rye and wheat with pollen mixtures including the pollen of other graminaceous species).
Agrobiologija (Agrobiology) 1956 : No. 3 : 15–22. [Russian].

Pollination experiments at Moscow on wheat and rye involving the use of the pollen of other species are described. *T. vulgare* 'Lutescens 62' was open pollinated or fertilized by large or small amounts of self pollen, by varied amounts of *T. dicoccum* pollen, large amounts of *T. dicoccum* pollen + small amounts of self pollen, and large amounts of self pollen + small amounts of *T. dicoccum* pollen. In addition, wheat was selfed and supplementarily pollinated with varied amounts of *T. dicoccum* pollen. The experiments on the rye Falenki Vjatka were along the same lines and involved pollinations with varied amounts of self pollen, the pollen of *Festuca pratensis*, *Bromus inermis* or mixtures of self pollen + foreign pollen. Observations on grain setting and morphological characteristics of the wheat and rye progenies are said to provide evidence for the participation of two pollen parents in crosses where self pollen + foreign pollen was used. A good grain set was obtained when unemasculated plants of wheat or rye were allowed to self pollinate and were then supplementarily pollinated by pollen of distant species. The progeny from such crosses was characterized by improved productivity and vigour.

1605 AFANASJEVA, A. S.
(**Some new data on fertilization processes in wheat**).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 32–39. [Russian].

Cytological observations on a 56-chromosome amphidiploid of wheat, fertilized by self pollen from the same and different ears of the plant, at Gorki Leninskie, provide evidence that, after the fusion of the male and female sex cells, supplementary male gametes reach the tissues surrounding the embryo sac and fuse with the nuclei of the nucellar cells. It is thought that this creates conditions which promote development of the embryo.

1606 CONTI, G.
I grani duri. (**The hard wheats**).
G. Agric. 1956 : **66** : p. 358.

The branched-ear wheat *Triticum ramosus* var. *iblaeum* described by Albo (cf. Abst. 412) is stated to be a form of the well-known *T. turgidum* var. *pseudo-cervinum*. Its agricultural value is doubted.

1607 PAQUET, J.
Interaction de la coloration du tégument et de la texture de l'albumen dans la détermination de l'intensité de la couleur du grain de blé. (**Interaction of seed-coat colouring and endosperm texture in determining the intensity of colour of the wheat grain**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1956 : **6** : 27–57.

Studies on the F_1 and F_2 of crosses between varieties with red seed-coats but differing in the intensity of red colouring and between varieties with red seed-coats and those with white seed-coats showed the red colour of the seed coat to be determined by three independent gene pairs, any one of which, either in the homozygous dominant (*RR*) or heterozygous (*Rr*) condition, results in the seed coat being red. The intensity of the red colouring was not dependent upon the number of genes for red seed-coat that were present or on whether the plant was homozygous or heterozygous for one or more of the genes *R* but varied according to the physical composition of the endosperm. Plants with a mealy endosperm had a light-red seed-coat, those with a flinty endosperm a dark-red seed-coat. The pericarp masked the colouring of the seed coat to a slight degree in some varieties but its influence was negligible. Endosperm texture appeared to be controlled by a number of complementary genes but was also influenced by environmental factors such as rainfall, date of sowing and amount of nitrogen available.

1608 ŠIBAEV, P. N.
(**The grain quality of northern wheats**).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 3 : 40–44. [Russian].

The baking and milling quality of some bread wheats in the Nonchernozem Belt is discussed and observations on the relations between agricultural methods and grain quality, especially the protein and gluten contents, are made. The results of qualitative analysis of Moscow, which is regarded as the best among the spring wheats, are presented in a table giving also the corresponding values for Lutescens 62 and Diamant [Diamond]. Among winter wheats Moscow 2453 is distinguished by its high protein content and its gluten content and bread quality are high. Other good winter varieties include Tulun 70, Garnet, Uljjanovka, Pšenično-Pyreĭnyĭ Gibrid 599 [Wheat-*Agropyron* Hybrid 599], Ferrugineum 1239, Ržano-Pšeničnyĭ Gibrid 46/131 [Rye-Wheat Hybrid 46/131] and especially Pšenično-Pyreĭnyĭ Gibrid 186 which has large vitreous grain, good gluten content and fine baking and milling properties. Reference is made to work on improvement of the spring wheat Moscow, which is characterized by premature post-harvest maturation. A new red-grained form selected from the white-grained variety is without this shortcoming.

1609 Peeters, G. & Maes, E.
La valeur boulangère des races sélectionnées de froment belge. Récolte 1954. **(The baking quality of selected varieties of Belgian wheat. 1954 harvest).**
Rev. Agric., Brux. 1956 : **9** : 973–86.

Data on the comparative baking quality of winter and spring wheats obtained from the plant breeding stations at Heverlee and Gembloux are presented. The baking quality of the spring wheats was better than that of the winter wheats; Koga, Alter, Alfy and Fylgia gave the best results in baking trials.

1610 Lazarov, D. M.
(An evaluation of the bread-making and baking quality of some of our cultivated wheat varieties harvested after the 1950-1951 season).
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1954 : **2** : 91–120. [Bulgarian].

The results of analyses made in Budapest of the grain, flour and baking properties of some Bulgarian hard and soft wheats are reported. Most of them were rated as of high or satisfactory quality.

1611 Miller, B. S., Hays, B. & Johnson, J. A.
Correlation of farinograph, mixograph, sedimentation, and baking data for hard red winter wheat flour samples varying widely in quality.
Cereal Chem. 1956 : **33** : 277–90.

In quality tests carried out on flour from five hard red winter wheats grown at 12 localities in Kansas in 1953–54 and on flour from eight varieties grown at 17 stations in 1954–55, highly significant positive correlations were found between (*a*) experimentally determined mixing time and mixing time as determined by means of the mixograph, (*b*) protein content and sedimentation value and (*c*) valorimeter value and sedimentation value. The correlation coefficients were high enough to be of use in predicting flour quality from simple and rapid tests.

1612 Cullinane, W. P. & Reeves, J.
The flour quality of early maturing wheat varieties.
J. Agric. W. Aust. 1956 : **5** : 469–77.

Details are given of tests carried out to determine the flour qualities of a number of wheat varieties. Under good conditions Pusa 4, Comeback and Festival produce flour of superior quality to that of Gabo, Wongoondy, Bungulla and Insignia 49, but under adverse conditions the varietal differences are less marked.

1613 Mac Key, J. & Månsson, T.
Resultat från kombinerade sort- och kvävegödslingsförsök i vårvete på Svalöf 1949–53. **(Results of combined varietal and nitrogen fertilizer trials of spring wheat at Svalöf, 1949-53).**
Sverig. Utsädesfören. Tidskr. 1956 : **66** : 182–96.

Differences in response to normal and heavy nitrogen top-dressings are reported for ten varieties. Except where yield was affected by low straw strength, unselected land races gave the same relative increase in grain yield in response to high nitrogen level as highly bred varieties, the latter outyielding the former by 17–18% at both levels. The value of the grain per ha., based on protein content, was only 15–16% higher in the highly bred varieties than in unbred material, since high yield was negatively correlated with protein content.

1614 Primost, E.
Über den Einfluss hoher Stickstoffgaben auf die Qualität verschiedener Winterweizensorten. **(On the influence of heavy applications of nitrogen fertilizer on the quality of different winter wheat varieties).**
Z. PflErnähr. Düng. 1956 : **74** : 42–59.

Varietal differences in the effect of applications of 200 kg. of nitrogen fertilizer per ha, on the quality of the flour of a number of winter wheats in Upper Austria are noted. Varietal differences in the effect of high levels of nitrogen fertilizer upon 1000-grain weight were also observed.

1615 **(At the Čeljabinsk Breeding Research Station).**
Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. **4** : cover page. [Russian].

The wheat Iskra [Spark] (Milturum 321 x Kitchener) bred at Čeljabinsk outyields Milturum 321 by 1·8 c. per ha. and shows resistance to lodging, shedding, rust and smut.

1616 Albanillo: frumento di collina. **(Albanillo, a hill wheat).**
Sementi elette 1956 : **2** : No. 8 : p. 59.

The variety is described as tolerant of cold and medium in earliness, being suitable for cultivation on high ground.

1617 SCHLUMBERGER, O. & SPAHR, K.
Untersuchungen über das verschiedene Verhalten von Weizensorten gegen Lagerung. (**Studies on the different behaviour of wheat varieties to lodging**).
Z. Acker- u. PflBau. 1956 : **102** : 1–26.

Factors affecting susceptibility to lodging are discussed with special reference to varietal differences and tabulated data are presented on the tendency to lodging of 13 of the more important varieties grown in Germany. Trials carried out at the Institute for Plant Cultivation and Breeding, Hohenheim, in 1953–54 indicated that Hauter II, Taca, Rimpaus Bastard II [Rimpau's Hybrid II] and Heine IV possessed a high degree of resistance.

1618 RUEBENBAUER, T. & RIEGEROWA, H.
Próba określania sztywności słomy pszenic ozimych na podstawie pomiarów nielicznych roślin. (**An attempt to determine straw stiffness in winter wheat on the basis of measurements of small numbers of plants**).
Acta agrobot., Warszawa 1955 : **3** : 45–73.

On the basis of measurements of straw length and thickness and internode number in winter wheats at Górka Narodowa, Poland, formulae for obtaining two coefficients, s and s', of straw strength for any one variety are developed, s being based on the straw thickness g and s' on g^2. The value s' is more accurate and therefore more suitable as a criterion for single plant selection than s. The coefficients may be useful in other breeding methods.

1619 NISHIKADO, Y. & YAMAUCHI, K.
(**On the mode of infection of *Gibberella Saubinetii* Sacc. in wheat**).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1949 : **38** : 99–104. [Japanese].

This study of the mode of infection of the above pathogen includes a section on the comparative resistance and nature of resistance of Japanese varieties.

1620 NISIKADO [NISHIKADO], Y. & INOUE, T.
(**On the sexuality of *Gibberella saubinetii***).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1953 : **40** : 191–94. [Japanese].

Cross-compatibility experiments involving a series of Japanese isolates showed that the above pathogen is homothallic.

1621 **Bison, top quality wheat variety, released in Kansas.**
Sth. Seedsman 1956 : **19** : No. 10 : p. 48.

A high yielding wheat variety, with superior milling and baking properties, has been developed from the cross (Oro x Tenmarq) x Chiefkan and is named Bison. It has good straw strength and is resistant to *Tilletia* spp. but susceptible to *Puccinia graminis* var. *tritici*, *P. rubigo-vera* var. *tritici*, *Ustilago tritici*, soil-borne mosaic and *Mayetiola destructor*.

1622 WARD, D. J.
World collection of wheat. Data compilation No. 1. Disease and agronomic notes recorded on the durum wheat collection grown at Chapingo and Mexe, Mexico in 1952; St. Croix, Virgin Islands and Mayaguez, Puerto Rico in 1952-53; Lincoln, Nebraska in 1953; and Fargo, North Dakota in 1954.
US Dep. Agric. 1956 : Pp. 98. (Mimeographed).

Tables are given recording data on reactions to *Puccinia rubigo-vera* var. *tritici*, *P. graminis* var. *tritici*, *P. glumarum* and *Septoria tritici* and on agronomic and morphological characters of *Triticum durum* representatives in the US world collection.

1623 WARD, D. J.
World collection of wheat. Data compilation No. 2. Disease and agronomic data recorded on strains from the wheat species collection grown at Chapingo and Irapuato, Mexico in 1952; St. Croix, Virgin Islands and Mayaguez, Puerto Rico in 1952-53; and St. Paul, Minnesota in 1954.
US Dep. Agric. 1956 : unpaginated. (Mimeographed).

Data are reported on the behaviour of *Triticum* species, other than *T. vulgare*, *T. durum* and *T. compactum*, with respect to agronomic properties and reaction to leaf, stem and stripe rusts and scab.

1624 KIVI, E. I.
The epidemic of wheat stem rust (*Puccinia graminis tritici*) on spring wheat in south-west Finland in 1951, primarily from the breeder's point of view.
Maataloust. Aikakausk. 1956 : **28** : 119–41.

Data are provided on the incidence of *P. graminis* var. *tritici*, *P. triticina* and *P. glumarum* on established varieties and breeding material in Finland during the rust epidemic of 1951. American varieties and the progeny of crosses involving American varieties were less heavily infected than north European varieties. (Cf. *PBA*, XXIII, Absts. 250 and 251).

1625 ACOSTA V., R. & RODRIGUEZ VALLEJO, J.
Gabo, variety susceptible to the new races of *Puccinia triticina.*
Robigo, Castelar 1956 : No. 1 : p. 9.

The Australian variety Gabo has shown marked susceptibility to some races of *Puccinia triticina* in Mexico.

1626 HARPER, A. M.
Soft white spring wheat in Southern Alberta.
Cereal News 1956 : **2** : No. 6 : 6–8.

A brief account is given of the soft-wheat breeding programme initiated at Lethbridge, Alberta, in 1949. Crosses have been made using Lemhi and some Australian varieties, such as Gabo, Quadrat and Insignia, and other rust-resistant varieties including RL2520, Exchange, Kenya 338AC2E2, CT192, White Spitzkop and Wise 250. The most promising lines so far are RL2520 x Lemhi and RL2520 x Quadrat, selections from both of which show good rust resistance.

1627 ACOSTA V., R. & RODRIGUEZ VALLEJO, J.
Lerma Rojo, a wheat variety.
Robigo, Castelar 1956 : No. 1 : p. 9.

A new wheat variety, Lerma Rojo [Red Lerma], has been developed in Mexico from the cross (Lerma 50 x Yaqui 48) x (Maria Escobar^2 x Supremo 211). It is resistant to the races of *Puccinia graminis* var. *tritici* prevalent in Mexico and yields well.

1628 ATHWAL, D. S. & WATSON, I. A.
Resistance to *Puccinia graminis tritici* in Khapstein, a *vulgare* derivative of Khapli Emmer.
Proc. Linn. Soc. NSW 1956 : **81** : 71–77.

The results of crosses involving Khapstein and a number of susceptible and resistant varieties of *Triticum vulgare* and *T. durum* are reported. The resistance of Khapstein to race 21 and the Australian races 222AB, 222BB, 126 Anz.1 and 126 Anz.2 was shown to be dependent upon two independently inherited factors, one of which is dominant and the other recessive. Each factor, when present singly, confers partial resistance; full resistance is attained when both factors are present. Crosses with other resistant wheats indicated that neither of the two factors for resistance in Khapstein was allelic with the factors for resistance in the other varieties. Khapstein can be crossed readily with common wheats and this appears to be a useful source of resistance to the Australian stem rusts.

1629 WELLS, D. G., CAFFEY, H. R. & AKHTER, S. W.
Inheritance of reaction to leaf rust of wheat caused by *Puccinia triticina* Ericks. in a cross involving a Fronteira derivative.
Agron. J. 1956 : **48** : 530–31.

The symbol Lr_F is proposed for the single dominant gene governing adult-plant resistance in the Fronteira [Frontier] x Hardired derivative Coker 47–27 (cf. *PBA*, XXV, Abst. 1753).

1630 KONZAK, C. F., BORLAUG, N. E., ACOSTA, A. & GIBLER, J.
Stripe rust resistant mutants obtained from irradiation of Gabo wheat.
Phytopathology 1956 : **46** : 525–26.

Among progenies from seed of Gabo exposed to X irradiation at 15,000 r. or to thermal neutrons at 2·3 x 10^{12} Nth/cm.^{2}, one N_3 line, otherwise similar to Gabo, bred true for a high degree of resistance and 12 further progenies from both treatments segregated for resistance. No resistant variants were found among a large number of untreated Gabo lines.

1631 JOHNSTON, C. O.
Unified number for races of *Puccinia triticina.*
Robigo, Castelar 1956 : No. 1 : p. 2.

A list is given of the physiological races of *Puccinia rubigo-vera* var. *tritici* which are included in each of the 24 unified races.

1632 WATSON, I. A. & STEWART, D. M.
Sources of wheat stem rust resistance.
Agron. J. 1956 : **48** : 526–27.

In tests of Khapli, Khapstein (Steinwedel x Khapli), Kenya Farmer, Egypt NA95 and three introductions of Kenya 117A for seedling reaction to isolates of prevalent North American races or groups of races, *viz.* 11–32, 15B, 17–29, 38 and 56, and to the new race NR21, Kenya Farmer was resistant to all isolates, Khapli was resistant to all isolates of all races except the last, Khapstein was similar in reaction except that it was less resistant to some isolates of the groups 11–32 and 17–29, and the other wheats varied in reaction to different races and isolates, the Kenya 117A strains W1347 and CI13140 and Egypt NA95 all showing one reaction pattern and Kenya 117A CI12568 another.

1633 **Stem rust race 15-B declining in midwest.**
What's New Crops Soils 1956 : **9** : No. 2 : p. 29.

In the USA and Mexico the percentage of infection caused by race 15B of *Puccinia graminis* var. *tritici* is reported to have decreased between 1953 and 1955 but the incidence of races 17 and 29 has increased.

1634 Watson, I. A.
The occurrence of three new wheat stem rusts in Australia.
Proc. Linn. Soc. NSW 1955 : **80** : 186–90.

The results of pathological studies with differential varieties on three new races of *Puccinia graminis* f. *tritici* recently discovered in New South Wales are reported. The first is race 21, which has been designated race 21 Anz 1 to denote its presence in Australasia; it is characterized by its ability to attack both seedlings and adult plants of the variety Celebration. The significance of the other two races, 126 Anz 3 and 222 Anz 4, has not yet been established.

1635 Rojas Mendoza, E.
Algunos aspectos de la raza 15B de *Puccinia graminis tritici* en el Perú. (**Some aspects of race 15B of *P. graminis tritici* in Peru**).
Bol. trimestr. Exp. agropec. Progr. Coop. Exp. Agropec., Lima 1955 : **4** : No. **4** : 2–5; Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 345 : 4–8. (Mimeographed).

Four biotypes of race 15B have been isolated in Peru and their reactions on the hosts Khapli, Mentana and Var. 11 are tabulated. Biotype 15B–2P, which has been numbered 189, attacks Khapli and is extending northwards. Evidence is presented indicating that the new biotypes originate on the *Berberis* spp. which occur wild in the Andes.

Several hybrids possessed of moderate resistance to these biotypes are under observation and one of them, whose pedigree is given as ME x H44–Marquis CI11782, has been named Helvia.

1636 Villanovoa N., R.
Recomendaciones generales para el cultivo del trigo Helvia. (**General recommendations for the cultivation of the wheat Helvia**).
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 349 : 11–15. (Mimeographed).

The new wheat named Helvia (cf. Abst. 1635) has proved extremely successful in both coastal and Andean zones of Peru and instructions are given for growing it. It has proved resistant to mildew and to *Puccinia glumarum*, *P. graminis* and *P. rubigo-vera*.

1637 Watson, I. A. & Stewart, D. M.
A comparison of the rust reaction of wheat varieties Gabo, Timstein, and Lee.
Agron. J. 1956 : **48** : 514–16.

Gabo (Bobin^2 x Gaza), Timstein and Lee (Hope x Timstein) all resembled Gaza in resistance to some Australian stem and leaf rust races and some American stem rust races but were unlike Hope or *Triticum timopheevi* and its derivatives in reaction. On the basis of these results it is suggested that Gaza is the source of resistance in all three and that the parentage of Timstein, previously supposed to be Steinwedel x *T. timopheevi*, is the same as that of Gabo.

1638 Jones, G. L. & Ausemus, E. R.
Inheritance of the mode of reaction to stem rust, particularly race 15B, and leaf rust in two crosses of vulgare wheats.
Agron. J. 1956 : **48** : 435–39.

This is an expanded account of work previously reported in *PBA*, XXIV, Abst. 255.

1639 Athwal, D. S. & Watson, I. A.
Inheritance of reaction to wheat stem rust in crosses involving Marquillo, Thatcher and Hochzucht.
Proc. Linn. Soc. NSW 1955 : **80** : 113–29.

The results of genetical studies on the resistance of Marquillo, Thatcher and Hochzucht [Pedigree] to races 126, 126B, 222AB, 222BB, 15, 15C, 21, 34, 38, 40 and 42 of *Puccinia graminis* f. *tritici* are tabulated. All these varieties appear to contain the same multiple factors for extreme resistance to the four common Australian races 126, 126B, 222AB and 222BB but differ in reaction to the other races. All three varieties proved highly susceptible to races 15 and 15C. Thatcher and Hochzucht were immune to races 21 and 42 but Marquillo proved semisusceptible. One of the factors conferring resistance to the Australian races was strongly linked with the locus conditioning resistance to these races in Kenya 744 and Kenya 117A. The immunity of Thatcher and Hochzucht to race 21 is governed by a separate single factor in each variety. These factors are allelomorphic and independent of the locus conditioning resistance to race 21 in Kenya 744 and Kenya 117A.

1640 Krăstev, K.
(Causes of the resistance of wheat to *Puccinia graminis tritici* (Pers.) Erikss. Hann. and *P. triticina* Erikss.)
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1954 : **2** : 127–48. [Bulgarian].

A triploid form of wheat, derived from the diploid variety Vernal, resembled the diploid form in its susceptibility or resistance to physiological strains of the above pathogen. The nature of resistance is discussed on the basis of these findings.

1641 Painter, R. H. & Peters, D. C.
Screening wheat varieties and hybrids for resistance to the greenbug.
J. econ. Ent. 1956 : **49** : 546–48.

An account is given of methods used at the Kansas State College, Manhattan, in screening varieties and hybrids in an insectary for reaction to the aphid *Toxoptera graminum.* Most of the 2141 introductions studied in a preliminary test were more susceptible than the susceptible control variety Pawnee, only 4% showing some resistance. F_2 data from crosses of a resistant selection of Dickinson with the susceptible varieties CI12518 (Chiefkan–Oro–Tenmarq), Concho and Pawnee suggested that resistance depended upon a recessive major gene.

1642 McNeal, F. H.
Inheritance of stem solidness and spikelet number in a Thatcher x Rescue wheat cross.
Tech. Bull. US Dep. Agric. 1956 : No. 1125 : Pp. 19.

After reviewing the literature concerning the inheritance of stem solidity, the relation of stem solidity to attack by *Cephus cinctus* and the inheritance of spikelet number in wheat, the author describes in detail information regarding the inheritance of stem solidity and spikelet number obtained from reciprocal crosses and back crosses between Rescue, with solid stems, and Thatcher, with hollow stems. Data, analysed by the partitioning method, indicate that the two varieties are differentiated by one major factor pair and two to four minor pairs in respect of stem solidity and one factor pair in respect of spikelet number.

1643 Middleton, G. K., Hebert, T. T. & Spain, G. E.
Mosaic resistant wheat Taylor 49.
Res. & Fmg. 1956 : **15** : No. 1 : p. 10.

A selection from Taylor which is highly resistant to mosaic has been named Taylor 49 (cf. *PBA*, XXIV, Abst. 1810).

1644 Nilan, R. A. & Gunthardt, H. M.
Studies on aged seeds. III. Sensitivity of aged wheat seeds to X-radiation.
Caryologia 1956 : **8** : 316–22.

Germination was studied in 2, 5 and 15-year old seeds of *Triticum vulgare* 'Baart' after X irradiation with 5000 r, 10,000 r, 15,000 r and 20,000 r, and mitotic irregularities were studied in the shoot apices from 1, 3, 13 and 17-year old seeds after exposure to 1000 r, 2000 r, 3000 r and 4000 r. In both series of experiments, the deleterious effects of X rays increased significantly both with dosage and with age.

1645 Šulyndin, A. F. & Poltyrev, E. M.
(Passing the vernalization phase in interspecific wheat hybrids).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 3 : 11–16. [Russian].

Hard winter wheats, with vernalization period upwards of 40 days and hardy under Harjkov conditions, have been bred at the Ukrainian Institute of Plant Culture, Breeding and Genetics. They were obtained by crossing soft wheats with hard wheats. The vernalization periods of the hybrid progenies became longer after sowing the hybrids for several generations as winter wheats. Normally the *Triticum vulgare* types acquired the habit of long vernalization period quicker than *T. durum* types derived from the same parents. The progenies of different components varied with regard to the number of plants with a long vernalization period. For instance, most of the F_3 of Lutescens 17 x Hordeiforme 1426/7 and Odessa 3 x Narodnaja [People's] had short vernalization periods. Others such as Odessa 3 x Krasavica Kabardy [Kabarda Beauty] gave an F_3 among which even the *T. durum* forms were characterized by vernalization periods nearly as long as those of the soft winter wheats. In the later generations the differences with regard to vernalization periods between the hard and soft-wheat types disappeared and families with periods longer than 40 days were selected among *T. durum* forms derived from most components. A family of Alabasskaja x Narodnaja in the F_5 had a longer vernalization period than the soft winter wheats Alabasskaja, Odessa 3 and Ferrugineum 1239.

1646 Pisarev, V. E. & Žilkina, M. D.
(Using boron in the breeding work with hybrids of low fertility).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **108** : 945–47. [Russian].

Work on the improvement of fertility of the amphidiploids referred to in *PBA*, XXV, Abst. 917, in particular of the wheat-rye amphidiploid AD20/1, has been continued. As a result of selection and spraying with 0·05% boric acid solution, the number of grains per ear rose steadily each year and forms with 26 spikelets and 92 grains per ear have been obtained.

BUCKWHEAT

1647 Petelina, N. N.
(Utilization of tetraploids in buckwheat breeding).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 2 : 58–59. [Russian].

Vegetative hybrid G448 was obtained by grafting a diploid variety Ivanovskaja on the tetraploid Boljševik [Bolshevik]. The first and second generations outyield the standard Kazanj and produce larger grain. Mention is also made of some hybrids with similar properties to G448 which have arisen spontaneously among plants of the varieties Kazanj and Ivanovskaja, grown close to the tetraploid form in the nursery.

1648 Sugawara, K.
(On buckwheat pollen. III. The relation between pollen germination and temperature).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **24** : 264–65. [Japanese].

The optimum temperature for pollination is 20° C. With increase in temperature, the initial rate of germination rises but pollen tube growth tends to become arrested before fertilization is effected.

OATS

1649 Bain, R., Morrison, D. & Blackett, G.
Oat variety trials in North-East Scotland 1952-55.
Scot. Agric. 1956 : **36** : 75–81.

This paper provides data on the yields, maturity, resistance to lodging and breaking of straw of two series of six varieties tested at several localities in Aberdeenshire. Ayr Commando and Blenda showed lodging resistance similar to that of the control variety, Sun II, and of the 12 varieties only Victory matured later than Sun II. Average yields showed no significant superiority of any variety over Sun II but Blenda, Ayr Commando and Victory showed a consistently higher percentage of dry matter per weight of kernel. Recommendations are made of varieties for different soil types, place in rotation and method of harvesting.

1650 Waterson, H. A. & Kent, N. L.
Yield and quality of spring oats in west of Scotland trials.
J. nat. Inst. agric. Bot. 1956 : **7** : 536–50.

Trials of 11 oat varieties have been carried out at Auchincruive, a lowland centre, and Cumnock, an upland centre, during the years 1952–4. Separate data are provided for the two centres on grain and straw yields, lodging, days to ripening and kernel characteristics. Blenda and Sun II were outstanding at both centres; varieties of satisfactory milling quality were, at Auchincruive, Reagle, Ayr Commando and Victory and at Cumnock, R30 and Ardee Potato.

1651 **Four eaglets. Oat variety trials 1952-55.**
Scot. Agric. 1956–57 : **36** : p. 165.

Information is given on the performance of the Dutch variety Marne, the Danish varieties Rex and Palu and the English oat Reagle in Scotland; all these oats have Eagle as one parent. None excelled Sun II.

1652 **Milns Deva oats.**
Milns Seeds : Spring 1957 : p. 26.

Bred by Miln & Co., Chester, England, from Grey Winter x Marvellous, Deva produces palatable straw of medium length, stronger than that of Sun II or Blenda. Its white grains are large and of fairly good quality. The variety is suited to medium and high soil fertility, being particularly suitable for areas of high rainfall. It ripens slightly earlier than Blenda.

1653 Mann, G. C.
Spring oat variety trials, 1952-55.
J. nat. Inst. agric. Bot. 1956 : **7** : 525–35.

Trials of five varieties at 16 centres in England, Wales and Scotland are reported (cf. *PBA*, XXV, Absts. 1914 and 1915), and data on grain yields, 1000-grain weights and percentage husk-content provided and discussed, together with observations on the field characters of the varieties. No improvement was shown over the control, Sun II, in respect of grain yield or straw production.

1654 Haver, 1957. **(Oats, 1957).**
Landbouwvoorlichting 13 : Bijl. 17; Ber. Rassenkeuze 1956 : No. 214 : Pp. 5.

The results of interprovincial trials conducted in the Netherlands in 1956 are tabulated and a brief description is given of each variety tested, together with recommendations as to the best varieties for cultivation in 1957.

1655 LAROSE, E. & DELVAUX, J.
Une nouvelle variété d'avoine Vigor. **(A new oat variety, Vigor).**
Rev. Agric., Brux. 1956 : **9** : 1098–99.

Vigor, a new white-grained variety characterized by its stiff straw and excellent resistance to lodging, was developed at the Gembloux Plant Breeding Station, Belgium, from a cross between Espoir de Gembloux [Gembloux Hope] and Blanche rigide de Gembloux [Gembloux Stiff White]. Intended to replace Blanche du Vieux Moulin [Old Mill White] on soils of medium to good fertility, Vigor matures a few days later than this latter variety, which it excels in yield and quality of grain. It is, however, more susceptible to drought than Blanche du Vieux Moulin.

1656 BUCHLI, M.
Hafersorten-Anbauversuche 1953/55. **(Cultural trials of oat varieties, 1953-55).**
Mitt. schweiz. Landw. 1956 : **4** : 112–17.

Data on time to maturity, resistance to diseases and frit fly, yield, pedigree, quality of grain and straw and resistance to lodging are presented for eleven varieties tested at the Federal Agricultural Research Institute, Zürich-Oerlikon, Switzerland, from 1953 to 1955. Carstens Gelbhafer VII [Carsten's Yellow oats VII] and Flämingstreue gave the best results in respect of early maturity, yield and resistance to frit fly.

1657 **Cereal news from Canada. Fredericton.**
Cereal News 1956 : **2** : No. **7** : 14–15.

The new oat Fundy (Ajax x Abegweit) has matured about 8 days earlier than Abegweit in tests at the Fredericton Experimental Farm, NB. Superior to Ajax and inferior to Abegweit in yield, it has a slightly stronger stem than either parent. The occurrence of heavy frosts in 1956 before some commercial fields of oats reached maturity demonstrated the importance of an early variety such as Fundy.

1658 **New hulless oat.**
What's New Crop Soils 1956 : **9** : No. **3** : p. 6.

A hulless oat variety, named Vicar, developed at the Cereal Breeding Laboratory, Winnipeg, from a plant found in a field of Garry oats has been licensed for sale in Canada. Resembling Garry in resistance to leaf and stem rust it is also resistant to *Helminthosporium victoriae* and moderately resistant to *Ustilago* spp. and *Pseudomonas coronafaciens*. It is late maturing, of medium height and strong strawed.

1659 **New winter oat combines good yield with hardiness.**
What's New Crops Soils 1956 : **9** : No. **3** : p. 20.

A new variety of winter oat named Bronco has been developed at the Texas Agricultural Experiment Station from the cross Lee x (Victoria x Fulwin). It is winter hardy, yields well and is slightly taller and later in maturity than its sister selection Mustang.

1660 **New rustproof oat.**
What's New Crops Soils 1956 : **9** : No. **2** : p. 24.

An oat variety of the Red Rustproof type, named Ferguson 560, is released for growing in southern Arkansas and is recommended for the outstanding uniformity of its plants and grain. Its parentage is not given.

1661 **Burnett oat released.**
What's New Crops Soils 1956 : **9** : No. **3** : p. 21.

A new, white, midseason oat variety, Burnett [Victoria x (Hajira x Banner) x Colo] has given yields equal to Mo.0–205 and Sauk in three-year tests in Iowa and is to be increased in 1957. With a higher test weight than Clintland and Mo.0–205 and plump kernels it combines resistance to the prevalent races of *Puccinia coronata*, *P. graminis* var. *avenae*, *Helminthosporium victoriae* and *Ustilago* spp. It is susceptible to physiologic leaf spot but this has not affected its yield in the trials.

1662 HOLDEN, J. W. H. & MOTA, M.
Non-synchronised meiosis in binucleate pollen mother cells of an *Avena* hybrid.
Heredity 1956 : **10** : 109–17.

A number of binucleate pollen mother cells were observed after injection of the flowering culm with colchicine in an F_1 hybrid ($2n = 21$) from a cross between *A. barbata* ($2n = 28$) and *A. strigosa* ssp. *hirtula* ($2n = 14$). One nucleus was centrally situated and resembled nuclei of normal cells in appearance and meiotic behaviour; the other was peripheral, lacked a nucleolus, had chromosomes showing reduced staining capacity, poor spiralization and fragmentation and finally degenerated and disappeared. The binucleate condition is attributed to failure of cell-wall formation at premeiotic mitosis, and the differentiation of the sister nuclei is thought to be determined by cytoplasmic gradients.

1663 Satarov, N. M.
(Changing spring oats into winter oats).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 11 : 9–11. [Russian].

A few winter-type plants of *Avena sativa* var. *aurea* were obtained by training the spring oat Lochow for the winter habit at Odessa.

1664 Grafius, J. E.
Components of yield in oats: a geometrical interpretation.
Agron. J. 1956 : **48** : 419–23.

From the premise that yield in oats may be represented as the volume, W, of a rectangular parallelepiped whose sides, X, Y and Z, respectively represent average number of panicles per unit area, average number of kernels per panicle and average kernel weight, five theorems are developed and proved. On this basis, it is shown that a universal variety, i.e. a variety whose yield is equal or superior to the mean yield at each locality in the region for which it is universal, should have the following characteristics: (*a*) $X + Y + Z > 3$ at each locality, the mean value for any component at each locality being 1; (*b*) $XYZ \geqslant 1$ over the region; (*c*) changes in the components should tend to counterbalance; (*d*) the longest side of the parallelepiped should be the side most subject to change. In a sample of 36 varieties tested over a region of varying night temperature, Ajax fitted the above specifications best.

It is suggested that breeding for improved yield may be best effected by increasing the smallest component in an otherwise good variety. Recurrent selection for yield in the absence of any strong positive correlation between components and without taking into account the yield components is regarded as likely to be unsatisfactory.

1665 Grafius, J. E.
The relationship of stand to panicles per plant and per unit area in oats.
Agron. J. 1956 : **48** : 460–62.

In 40 oat varieties it was found that, within varieties, yield was influenced by number of panicles per unit area and by size of panicle, but not by seed size, which varied little. Two theorems on the relations between density of stand and number of panicles per plant and between density of stand and number of panicles per unit area are developed and proved and on this basis it is shown that most of the varieties studied compensate readily for change in density of stand by altering the number of panicles per plant.

1666 Miczyński, K.
Studia nad wrażliwością odmian owsa na głownię przy sztucznym zakażeniu. Część II. **(Studies on the susceptibility of oat varieties to smut upon artificial inoculation. Part II).**
Acta agrobot., Warszawa 1955 : **3** : 179–217.

Work carried out at the Kraków School of Agriculture during 1948–53 is reported. Of 17 oat varieties tested for reaction to 40 collections of *Ustilago avenae*, the following seven were finally selected for use as differentials: Lischower Früh [Lischow Early], Lochows Gelb [Lochow's Yellow], Richland, Gopher, Nicol, Camas and Fulghum. Some of the smut collections varied in virulence from year to year and it appeared that the pathogenicity of a smut sample could be altered by passage through a susceptible variety.

By means of the differential varieties a total of nine groups of physiological races could be distinguished, most of the collections tested belonging to group I, the least virulent.

Of 100 varieties tested in 1948 and 1952 for reaction to groups I and VII, 45 showed complete or very high resistance. Among this resistant material were all the strains of *Avena strigosa* tested, most of the *A. byzantina* strains and numerous varieties of *A. sativa*, including the Polish varieties Antoniński Najwcześniejszy [Earliest Antoniński], Grodwicki, Jeżewski and Więcławicki Jubilenszowy [Więcławicki Jubilee]. Three out of 11 varieties tested in 1953 with several physiological groups were completely or highly resistant to all smut populations, namely Jeżewski, Forvic and Sofia 6; Antoniński Najwcześniejszy and Kompolt F also showed little infection.

1667 Halisky, P. M. & Holton, C. S.
Factors for pathogenicity in *Ustilago avenae*.
Phytopathology 1956 : **46** : p. 636. (Abst.)

On the basis of evidence obtained from a study of the pathogenicity to oats of some of the progeny of crosses between races A5, A6 and A7 of *U. avenae* it is suggested that in some cases pathogenicity is controlled by a recessive factor pair.

1668 Simons, M. D.
Physiologic races of crown rust of oats identified in 1955.
Plant Dis. Reptr. 1956 : **40** : 810–13.

Data are provided on the prevalence and distribution of 18 races of *Puccinia coronata* var. *avenae* in Canada, the United States and Mexico in 1955. Race 202 comprised 47% of the total isolates from uredial collections, race 203 19% and race 258 6·5%.

1669 Cruickshank, I. A. M.
Physiologic specialization of oat crown-rust (*Puccinia coronata* f. sp. *avenae*) in New Zealand.
NZ J. Sci. Tech. 1956 : **38** : 359–62.

Thirteen races of *P. coronata* f. sp. *avenae* have been identified in collections made in New Zealand in 1953 and 1955 and are given a descriptive formula in terms of resistant varieties (cf. *PBA*, XXVI, Abst. 1216). The reactions of additional varieties and hybrid lines being used in oat breeding at the Crop Research Division were determined for all races except race 8 and Garry (Victoria x Richland x Fulghum) x Belar and Victoria x Richland x Algerian were found to possess resistance to all races. The results of the tests are discussed in relation to oat breeding in New Zealand.

1670 Baker, E. P. & Upadhyaya, Y. M.
Physiological specialization in crown rust of oats.
Proc. Linn. Soc. NSW 1955 : **80** : 240–57.

Studies on physiological specialization in *Puccinia coronata* f. *avenae* in eastern Australia are reported. Ten races were recorded and the reactions of a number of varieties to each of these races are noted; one of the races was capable of attacking the hitherto immune variety Victoria. Methods of breeding for resistance are discussed; they include interspecific hybridization, the induction of mutations and the use of combined resistance to several races to give newly released varieties a better opportunity of surviving attacks.

1671 Roberts, B. J. & Moore, M. B.
The effects of temperature on the resistance to oat stem rust conditioned by the BC genes.
Phytopathology 1956 : **46** : p. 584.

When seedlings of four lines were inoculated with race 7, to which they were resistant at 75° F. but susceptible above 85° F., and were grown under conditions such that some plant parts were at 75° F. and some at 85° F., only the parts exposed to the higher temperature became diseased, indicating that any plant substance or substances responsible for resistance or susceptibility are not, or are only very slowly, translocated.

1672 Clark, R. V. & Derick, R. A.
***Septoria* leaf blotch of oats.**
Cereal News 1956 : **2** : No. 7 : 10–12.

The article includes a short account of testing varietal resistance to *S. avenae* in the greenhouse and field in Canada. Under field conditions, the four varieties of *Avena sativa* showing some tolerance have not been consistent in their reactions in different years. Varieties which have exhibited resistance consistently have been derived from *A. strigosa*, *A. brevis* and *A. nuda-brevis*.

1673 Rivers, G. W., Raab, Q. J. & Atkins, I. M.
A technique for inoculating oat plants in the seedling stage to determine their reaction to *Helminthosporium victoriae*.
Agron. J. 1956 : **48** : p. 428.

Testing for reaction to *H. victoriae* was satisfactorily effected by first spraying the seedlings at the one-leaf stage with a spore suspension containing a detergent as wetting agent and then keeping them for 48 hours at 28–34° C. and 100% humidity. Between 18 and 24 hours after removal to a dry atmosphere at 21–30° C. the plants were dry and could be classified according to distinct symptoms.

1674 Andersson, H.
Undersökningar rörande vanliga fritflugan *Oscinella frit* L. (**Investigations on the frit fly, *O. frit* L.**).
Sverig. Utsädesfören. Tidskr. 1956 : **66** : 249–80.

In investigations carried out at Åkarp, Sweden, oats resistant to frit fly attack were characterized by reddish coloration, by coleoptiles which remained at a stage suitable for oviposition for a shorter period than those of susceptible varieties and by scabrous shoots the barbules of which are thought to irritate the female fly and deter her from laying eggs.

RYE

1675 Thörn, K.-G.
Försök med höstråg i Norrland. (**Trials of winter rye in Norrland**).
Medd. Jordbruksförs. 1956 : No. 73 : 65–83.

Details are given of the performance of 17 winter rye varieties, including both commercial and unreleased strains, in tests carried out during

1944–53 in five distinct agricultural areas in northern Sweden.

1676 FERWERDA, F. P.
Recurrent selection as a breeding procedure for rye and other cross-fertilized plants.
Euphytica, Wageningen 1956 : **5** : 175–84.

A method of applying reciprocal recurrent selection (cf. *PBA*, XX, Abst. 263) to rye and other cross-pollinating plants with bisexual flowers is outlined. Its advantages over breeding systems based on polycross testing include the avoidance of inbreeding depression and a more rapid achievement of the desired results. The method has shown promise in experiments at Hoofddorp and Wageningen, Netherlands.

1677 **Elbon rye for winter pasture.**
What's New Crops Soils 1956 : **9** : No. 3 : p. 21.

A new rye variety, Elbon, released by the Oklahoma Agricultural Experiment Station, has been found to give more forage than any other small grain under Oklahoma conditions. Thought to be a selection from Abruzzi, it is earlier, more erect, lighter in colour and a heavier forage producer than Abruzzi and gives higher grain yields than Balbo.

1678 REES, H. & THOMPSON, J. B.
Genotypic control of chromosome behaviour in rye. III. Chiasma frequency in homozygotes and heterozygotes.
Heredity 1956 : **10** : 409–24.

The chiasma frequency was scored for four inbred lines and for the F_1 families from all possible crosses between them. The F_1 families were found to exhibit heterosis for chiasma frequency and also apparent overdominance which could be explained by nonallelic interaction. Analysis of environmentally induced variation showed (1) less variation between plants within F_1 families than within inbred lines and (2) less variation in heterozygotes than in homozygotes. Equally homozygous inbred lines were found to differ in stability in respect of chiasma frequencies and it is suggested that stability, measured as the variation between plants, between cells and between bivalents is genotypically controlled at these three levels. The gene systems controlling variation at each level and the mean plant chiasma frequency are all different and show some independence in inheritance.

It is suggested that variation in chiasma frequency between pollen mother cells results from intercellular variation in cytoplasm. There is less variation in heterozygotes, between which differences in degree of variation are found. Within inbred lines chiasma frequencies are negatively correlated with cell variances and bivalent variances and frequency per cell is found to have an upper limit, so that an increase in cell variation lowers the mean. (Cf. *PBA*, XXV, Abst. 2974).

1679 BOSE, S.
Aberrations in the nucleolar chromosome of inbred rye.
Hereditas, Lund 1956 : **42** : 263–92.

Pretreatment with oxyquinoline made it possible to detect small aberrations in the mitotic chromosomes of different inbred lines of Stålråg [Steel rye]. These were found to differ significantly from one another and the parental variety in the ratio of the lengths of the long arm and short arm (minus the satellite) of the nucleolar chromosome. Line 113, for example, was characterized by a shortening of the long arm, whereas in line 121 the short-arm region was increased in length and the satellite was diminished in size. These deviations in the lengths of the short arm and satellite were respectively associated with the presence or absence of heterochromatic knobs. Line 78, homomorphic for a small short arm and large satellite, was crossed with line 121. Selfing of the heteromorphic F_1 gave rise to an F_2 consisting of different homomorphic and heteromorphic types as the result of the random union of ♂ and ♀ gametes with or without F_1 cross-overs. Among the F_2 plants containing new types of combination of the nucleolar chromosomes were three homomorphic with respect to the large short arm of line 121 and the large satellite of line 78. These three individuals appeared to be less vigorous than other F_2 plants. It is suggested that lines 113 and 121 originated as the result of selfing of heteromorphic plants in the population; the fact that plants with one normal chromosome and one chromosome of the type occurring in either of these lines have been found in populations grown in different years supports this suggestion.

1680 THOMPSON, J. B.
Genotypic control of chromosome behaviour in rye. II. Disjunction at meiosis in interchange heterozygotes.
Heredity 1956 : **10** : 99–108.

An analysis of the frequencies of disjunction of interchange configurations at metaphase I in F_3 and F_4 families derived from an F_1 plant heterozygous for two interchanges indicated that disjunction was genotypically controlled. There was evidence that in plants of some families the disjunction properties of the two interchange configurations were not independent. The possibility that selection would be effective in adjusting the degree of disjunction to achieve greater fertility and that such a selective effect has played a part in the establishment of interchange heterozygotes in *Oenothera* and *Campanula* is discussed.

1681 Mori, T.
(The relation between induced chromosome replication in mixoploid rye and the amount of water supplied).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1948 : **61** : 81–82. [Japanese].

The proportion of polyploid cells in heat-induced mixoploid rye rose as the water supply was reduced.

1682 Lundqvist, A.
Self-incompatibility in rye. I. Genetic control in the diploid.
Hereditas, Lund 1956 : **42** : 293–348.

An analysis of intercrosses within two S_1 families derived from clones of two of the previously studied diploid plants of Stålråg [Steel rye] confirmed the author's hypothesis that self incompatibility in rye is determined by the combined action of two multiallelic systems of the oppositional type designated *S* and *Z* respectively (cf. *PBA*, XXV, Abst. 984). The data indicated sporophytic control of the incompatibility reaction of the style, with independent action of the alleles. A study of advanced families derived from the S_1 plants showed that the two loci exert gametophytic control over the pollen. Pollen with both genes matched in the style is effectively inhibited. Irrespective of the locus involved, pollen with one gene matched in the style is not at a functional disadvantage compared with pollen containing no genes in common with those in the style. Unpublished data from an analysis of incompatibility relationships in tetraploid rye have indicated that not all of the four genes carried by the diploid pollen need correspond to those in the style in order to produce a complete reaction of incompatibility. The ineffectiveness of a single gene common to the pollen and style in diploid rye cannot therefore be satisfactorily interpreted by assuming that a threshold value exists for the incompatibility reaction, or that the promotion of pollen-tube growth by dissimilar factors in the pollen and style always dominates the inhibitory effects of genes in common. It is postulated that the two loci behave as a physiological unity and that the specific substances involved in the incompatibility reaction are the result of interaction between alleles at the two loci.

1683 Lekczyńska, J. & Wioncek, J.
Warunki tworzenia się gałęzistych kłosów żyta. **(Conditions governing the formation of branched ears in rye).**
Acta agrobot., Warszawa 1954 : **2** : 103–08.

Ultraviolet irradiation of the germinating seed was ineffective in inducing branched heads in Universalne [Universal].
Plants of the same variety grown from vernalized seed at high levels of fertilizer application produced three-flowered spikelets and their progeny, also grown at high fertilizer levels and subjected to 10-hour photoperiods from 11 April to 9 May, included plants with (*a*) lax heads and short thick stalks, (*b*) single branches at the base of the ear and additional empty ears at the base of the last leaf or (*c*) ears branching in the middle or near the base.

1684 Wagner, S.
Vom Bergroggen zum Cadi. **(From mountain rye to Cadi).**
Mitt. schweiz. Landw. 1956 : **4** : 169–72.

The new variety Cadi, developed by the Federal Research Station, Zürich-Oerlikon, Switzerland, from material found in the mountainous districts of Wallis, Tessin and Graubünden, is described. Besides being highly productive, it is resistant to low temperatures, heavy snow-falls and lodging and has a high 1000-grain weight.

MAIZE

1685 Fenaroli, L.
Uno sguardo panoramico alla maiscoltura Italiana. **(A survey of maize cultivation in Italy).**
Maydica, Bergamo 1956 : **1** : 98–108.

In a brief outline of the development of maize cultivation in Italy a list is given of the many local varieties found in different regions in various periods and the principle of heterosis as applied to maize breeding is once more explained. Over a quarter of the maize area of Italy is now sown with hybrid maize, which will have added some 6 million centners to the total crop in 1956.

1686 Arruda, H. Vaz de
Eficiência do delineamento em blocos ao acaso, em experiências comparativas de variedades e híbridos de milho. **(Efficiency of a randomized-block layout in comparative tests of maize varieties and hybrids).**
Bragantia 1954 : **13** : 217–22.

The experiments described show a gain of 30%

in efficiency by the use of randomized blocks as opposed to a completely randomized design. The mean coefficient of variation was 16·1%.

1687 Pisarev, V. E. & Žilkina, M. D.
(The maize Podmoskovnaja).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 3 : 51–53. [Russian].

The population Podmoskovnaja [Moscow Suburban] was obtained at Nemčinovka by open pollination of Severjanka [Northern], originating from Dnepropetrovsk, with a number of other varieties and hybrids. It has a tall habit, produces long ears and ripens early under Moscow conditions. It is productive of grain and forage. Work on its improvement continues and consists chiefly of selection of long-eared forms and those developing ears higher than 34 cm. above the ground.

1688 De Preter, E.
L'amélioration du maïs à Gandajika. (**Maize breeding at Gandajika**).
Bull. INEAC 1956 : 5 : 155–72.

An account, illustrated by photographs, is given of the application of modern breeding and selection techniques to the development of new synthetic lines and single and double hybrids at the Gandajika Experimental Station in the Belgian Congo. New hybrids and varieties bred at the station include GAN, GPS1, GPS2 and GPS3, all of which are well adapted to the tropical conditions prevailing in this part of Africa. The principal aims of the station include breeding for earliness and resistance to *Diplodia* spp., *Fusarium* spp., *Gibberella zeae*, *Sclerospora maydis*, *Helminthosporium turcicum* and *Puccinia polysora*. Differences between varieties or hybrids in susceptibility to these diseases are noted.

Mejoramiento del maíz. Primera Reunión Centroamericana Turrialba, Costa Rica, 24–30 de Octubre de 1954. (**Maize breeding. First Central-American Meeting, Turrialba, Costa Rica, 24-30 October 1954**) : Pp. 465. (Mimeographed).

The following contributions are concerned with plant breeding.

1689 *Hernández Corzo, A. Historia, usos e importancia del maíz. (History, uses and importance of maize). (pp. 35–45).*

Reference is made to excavations in Mexico in which pollen identified as that of maize has been found at a depth of 70 m., in strata dating back probably over 25,000 years, and fossil ears dating back some 4445 ± 280 years. These facts, together with many legends and the abundance of representations of maize in ancient ceramics, are taken as evidence of the American origin of maize and contrasted with the total absence of such evidence in the Old World. The way in which maize spread from Spain, after its introduction in 1492, to the rest of Europe and to Africa and Asia is traced and the relatively little change it has undergone since being taken into cultivation is pointed out. An account is given of the various ways in which the maize plant can be utilized.

1690 *Ensayos uniformes de rendimiento. (Uniform yield tests). (pp. 97–162).*

Reports were presented on trials of varieties and hybrids carried out in Panama, Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala, Mexico and Colombia; the best average yield was given by the variety Cuba Yellow Dent with 2989 kg. per ha. in 1954, this being 16·4% more than that of Amarillo de Cuba [Cuba Yellow] and Cuba 38; next in order came the hybrids L1 x L21, Rocol H–203 and Rocol H–201.

Details are also given showing the origin of the varieties and hybrids tested.

1691 *Observaciones en las colecciones. (Observations on the collections). (pp. 165–93).*

A number of varieties from the bank of germ plasm were selected for observation and data are given concerning their date of flowering and maturity, reaction to *Helminthosporium*, *Puccinia* and lodging, yield and certain other features.

1692 *Espinoza S., E. Pruebas comparativas de variedades de maíz en Panamá. (Comparative tests of maize varieties in Panama). (pp. 197–201).*

Of a total of 72 hybrids from the southern states of the USA only 6 showed any promise when tested in Panama. The best yields were given by certain varieties and hybrids from Colombia, Venezuela and Guatemala.

1693 *Venegas, R. Presentación de la información acumulada. (Presentation of information collected). (pp. 202–32).*

In trials carried out in Costa Rica with 41 local varieties and 8 introduced from Mexico, the Mexican variety Rocamex V–520C gave the highest yield in 1951. In tests with Mexican hybrids designed for tropical conditions, some of them yielded up to 18% more than Rocamex V–520C.

In more extensive tests in 1953, several double, triple and single-cross hybrids outyielded V–520C, the best being a double hybrid made up on the formula of Rocamex H–501.

1694 *Gutiérrez G., M. Rendimiento y comportamiento agronómico de variedades de maíz probadas en 1953 y 1954 en el Instituto Interamericano de Ciencias Agrícolas, Turrialba, Costa Rica, C.A.* (*Yield and agronomic behaviour of maize varieties tested in 1953 and 1954 in the Inter-american Institute of Agricultural Sciences, Turrialba, Costa Rica, CA*). (*pp. 233–41*).

The results of trials with 85 varieties and hybrids are presented, data being presented on yields, lodging and stem breakage.

1695 *Bueso Arias, E. Presentación de la información acumulada.* (*Presentation of the information collected*). (*p. 242*).

Selection 142–48 from Guatemala, Rocamex V–520C from Mexico and certain other imported varieties have exceeded the local varieties in yield when grown in Honduras.

1696 *Merino Argüeta, J. Prueba de variedades y cruzas de maíz.* (*Trial of maize varieties and crosses*). (*pp. 243–46*).

Some 150 introduced varieties have been tested with 50 local varieties in trials in El Salvador. Very few of the introductions were as good as the local selections such as Taverón, Empalizada [Palisade] and Raque Capulín, all of which are short, early varieties resistant to lodging and wind damage. The most successful of the introductions were all taller and later in maturity. Double-cross and triple hybrids from Mexico have however outyielded the local varieties and a breeding programme has been initiated in which crosses are being made between imported and local varieties. The parents of the best combinations are being selfed to produce inbred lines and a number of them have been tested in top crosses with Taverón.

1697 *Reyes Castañeda, P. Datos regionales en el programa cooperativo centroamericano durante los ciclos 1950–1951.* (*Regional data from the Central-American cooperative programme in 1950–1951*). (*pp. 247–53*).

In trials carried out in Guatemala, Honduras, Costa Rica, Colombia and Mexico, Rocamex V–520 and other Mexican varieties and hybrids have consistently proved superior to the local varieties of the respective countries.

1698 *Reyes Castañeda, P. Bosquejo del mejoramiento de maíz en los trópicos de México.* (*Sketch of maize breeding in the tropics of Mexico*). (*pp. 254–67*).

The varieties Tuxpeño and Vandeño are representatives of the many excellent maize types that exist in the tropical coastal belt of Mexico; their main defect is insufficient standing capacity. An outstanding selection from Tuxpeño is San Luís Potosí 20, which has entered commerce under the designation Rocamex V–520; it is a white dent variety distinguished by resistance to *Helminthosporium* sp., drought and lodging, with a maturity rating of 135–140 days, and is adapted to hot areas from 0 to 1000 m. in altitude, where it outyields the local varieties by up to 15%. It has given rise to several valuable lines that are used as parents in making hybrids. Rocamex V–520C is another selection of the Tuxpeño type, less resistant to lodging and drought but more so to *Laphygma frugiperda*; it is adapted to hot, humid regions from 0 to 1200 m. in altitude and outyields the local varieties by 20%; its maturity rating is 135–140 days in summer and 145–150 days in winter sowings. It is also known as Capitaine and a yellow form, known as Amarillo de Capitaine [Capitaine Yellow] also exists.

Papaloapan I is another Tuxpeño selection, with yellow grain and coloured ears; it is less resistant to lodging and to rotting organisms. A number of other selections which are being used for crossing are described, together with others suitable for altitudes of 0 to 500 m.

Hybrid Rocamex 4–501 is described as suitable for irrigated or humid zones from 0 to 1000 m. in altitude; it has a maturity rating of 120–125 days and has yielded an average of 20% more grain than V–520C. Rocamex H–502 is suitable for the hot areas of central and northern Mexico at altitudes of 0–500 m. and has also yielded 15–20% more than V–520C. Rocamex H–503 is suitable for the same areas as H–501 but has a maturity rating of 130–140 days and has higher yielding ability, outyielding the local varieties by as much as 28%; it is relatively resistant to *Helminthosporium* sp.

1699 *Cassalett D., C. Mejoramiento de maíz en Montería.* (*Maize breeding in Montería*). (*pp. 267–69*).

Brief descriptions are given of the local maize types of Colombia and of a certain number of introductions that are under observation; of these the Mexican variety Rocamex V–520 has done well in hot districts.

1700 *Yepes, E. A. Informe sobre el desarrollo del programa de mejoramiento de maíz para tierra fría.* (*Report on the development of the programme of breeding maize for cold districts*). (*pp. 269–72*).

Observations have been made in Colombia on some 500 local varieties and 1251 introductions, in addition to a number of inbred lines, hybrids and top crosses. A promising hybrid for forage purposes, which produces grain at the wax-ripe stage in 6½ months, has been obtained and tests are being made on parents suitable for producing hybrids of sweet corn.

1701 **Director's Annual Report of the Central American cooperative corn improvement project, 1955.**
Rockefeller Found., NY : Pp. 21.

Annual conferences on corn improvement were held at Turrialba, Costa Rica, in October 1954 (cf. Absts. 1689–700) and December 1955. Trials of both white and yellow varieties and hybrids were planted at several stations in each of the Central American countries. The hybrid Mexico H–501 has done well in Guatemala, El Salvador, Nicaragua and Costa Rica and programmes for its production in these countries have been initiated.

1702 BORRIES, G. VON
Maíz genético. (**Genetic maize**).
Campesino, Santiago 1956 : **88** : No. 8 : 17–21; No. 9 : 29–33.

After a brief exposition of the basic principles of genetics a description is given of the methods of improving maize varieties by selection and by the production of hybrids from inbred lines.

1703 ROELOFSEN, B.
Mais en maiscultuur in Indonesië. (**Maize and maize cultivation in Indonesia**).
Pemb. Balai Besar Penj. Pert. Bogor 1956 : No. 142 : Pp. 101.

This general account of the history and cultivation of maize includes brief data on variety trials at different centres in Java and Sumatra and breeding work at the Bogor Central Experimental Station.

1704 DI SCALEA, R.
Lester Pfister, l'inventore dei mais ibridi. (**Lester Pfister, the inventor of hybrid maize**).
Agricoltura, Roma 1956 : **5** : No. 5 : 49–53.

The story of the first commercial production of hybrid maize in the USA is retold and figures are given showing that its use in Italy has increased the grain yields by 25–30%.

1705 SCHAD, C.
La coopération internationale pour l'amélioration du maïs en France. (**International cooperation in maize breeding in France**).
Bull. tech. Ing. Serv. agric. 1956 : No. 112 : 429–33.

The development of new varieties of hybrid maize in France is discussed, mention being made of cooperation, under the auspices of FAO, between French maize breeders and maize breeders in other countries.

1706 ZUCCHINI, M.
Coltivazione del granoturco e mais ibridi. (**Maize growing and hybrid maize**).
Sementi elette 1956 : **2** : No. 8 : 20–27.

Descriptions are given of some of the hybrids most suitable for cultivation in central and southern Italy, where the absence of rainfall in the summer months is the limiting factor; the hybrids recommended are early or midearly types.

1707 SIDOROV, F. F.
(**Growing the seed of interline maize hybrids from the Institute of Plant Industry**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 2 : 18–21. [Russian].

Among the new double-cross standards from the institute (VIR), VIR156 is notable for its high yield, VIR25 for hardiness and early ripening, VIR42 for moderate soil and moisture requirements, VIR50 for a high degree of drought resistance and VIR63 for resistance to lodging on irrigated land.

1708 BUZULIN, G. S.
(**Maize varieties recommended for trial in agriculture in the Tambov province**). Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 1 : 3–6. [Russian].

Several varieties among some 100 tested ripened grain by 15 September at Mičurinsk in the Tambov province and gave yields of up to 55 c. of grain per ha. Yield increases of up to 67% have been obtained from hybrids between suitable parental varieties such as Minnesota x Partizanka.

1709 POPOW, G. & KELLER, A.
Maishybrid Orla 266. (**The maize hybrid Orla 266**).
Mitt. schweiz. Landw. 1956 : **4** : 153–62.

The new early-maturing hybrid Orla 266, derived from a cross between the white-grained 12-rowed Rheintaler [Rhine Valley], and the American hybrid W–X x W–J, is described. In recent trials at the Zürich-Oerlikon Experimental Station, Switzerland, it outyielded Rheintaler, Wisconsin 255 and Wisconsin 270 by a considerable margin but proved slightly susceptible to lodging.

1710 GENČEV, G.
(Choosing the components for crossing in hybrid maize seed production).
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1956 : **3** : 207–33. [Bulgarian].

This report on maize hybridization at Sofia deals mainly with the basis upon which the components for heterotic hybrids should be selected. It was found that hybrids that bore grains larger than the seed parent were distinguished by vigour and heterosis for yield and that the increment in the size of grain over that of the seed parent was proportionate to the amount of heterosis. Selection for large grain is discussed in relation to maintenance of heterosis in later generations of intervarietal hybrids.

1711 **Synthetic maize.**
Kenya Fmr. 1956 : 61–62.

The development of synthetic maize varieties in Kenya and their advantages are discussed.

1712 WALLACE, H. A.
Corn and the Midwestern farmer.
Proc. Amer. phil. Soc. 1956 : **100** : 455–66.

The role of maize production in the development of the midwestern region of the USA, from the close of the American Revolution until the present time, is outlined. Information on the ancestry of the maize now being cultivated in the Corn Belt and on the early history of hybrid production is included.

1713 NEAL, N. P. & STROMMEN, A. M.
Supplement to Wisconsin corn hybrids.
Bull. Wisc. agric. Exp. Sta. 1956 : Suppl. No. 476 : Pp. 15.

This supplement (cf. *PBA*, XXII, Abst. 243) includes a summary of the results of trials of hybrids in various localities in Wisconsin during 1954 and 1955, an outline of the method of producing hybrid seed with the aid of cytoplasmically ♂ sterile parents and information on the six new hybrids released in 1956. The hybrids, designated W253, W273, W423, W463, W465 and W530, range in time taken to reach maturity from 80 to 105 days. The first four are three-way crosses and the last two double hybrids.

1714 GALLO MENDOZA, G.
Informe preliminar sobre la obtención de maíces híbridos en Tucumán. **(Preliminary report on the production of hybrid maize in Tucumán).**
Rev. industr. agríc. Tucumán 1955 : **39** : 66–75.

An outline is given of the systematics of *Zea mays* and grounds are cited for believing that maize originated in Mexico and passed from Central to South America rather than *vice versa* as supposed by Mangelsdorf and Reeves.

Selfed lines from a number of Italian and North American varieties have been prepared and a method whereby farmers can produce their own hybrid seed is described.

1715 VAN SCHAIK, T. & LE ROUX, P. M.
Hybrid maize for the Transvaal region.
Fmg. in S. Afr. 1956 : **32** : No. 8 : 47–49.

Progress made in the development of hybrid maize suitable for growing in the Transvaal region is briefly reported. Promising lines include P3158, PP x K64, SA–11 and SA–200.

1716 JENKINS, M. T.
Report of the Tenth Northeastern Corn Improvement Conference, New York City, March 11-12, 1955 : Pp. 19. (Mimeographed).

Brief reports are given of the various committees on the uniform testing of maize inbreds and hybrids belonging to different maturity groups. In a discussion on cytoplasmic sterility, co-operation with the North-Central and Southern groups of investigators in devising a standard terminology for types of such sterility and for fertility-restoring genes was agreed upon. A discussion on disease resistance dealt with various aspects of the problem of *Gibberella* and *Diplodia* stalk rots. In a discussion on the water relations of growing maize, L. L. Huber stressed the importance of determining the water requirements of inbreds and also recommended use of closer planting in comparing hybrids for yield.

1717 ECKHARDT, R. C.
Report of the Twelfth Southern Corn Improvement Conference, Birmingham, Alabama, January 10-11, 1956 : Pp. 44. (Mimeographed).

The first discussion dealt with problems of insect attack upon maize. J. W. Ingram presented a list of single crosses which had exhibited various degrees of resistance to earworm in Mississippi. Referring to work in Georgia, C. C. Blickenstaff reported that, with respect to ratings for earworm resistance and husk extension and tightness, inbreds and their combinations with a common single-cross tester were highly correlated. Rapid visual estimation of the grade of the plot without any handling of the ears was as effective as detailed examination of the individual ears in classifying crosses for earworm injury. In controlled pollination, treatment of glassine bags with aldrin or heptachlor was highly effective in reducing damage due to earworm and army worm. Tests of the earworm resistance of inbreds crossed with uniform testers and of recommended hybrids in S. Carolina were commented upon by V. M. Kirk. None of the inbreds surpassed the recommended hybrids in resistance, which was not necessarily related with length and tightness of the husks. W. G. Eden provided data on corn-borer damage in variety trials in Alabama.

In the discussion on fungal diseases and nematodes, C. M. Kozelnicky and A. A. Fleming reported good progress in developing lines resistant to *Helminthosporium* blight in Georgia. They also found that in general the reactions of inbreds to *Diplodia zeae* and *D. macrospora* were associated; NC64 was resistant to both species. M. T. Jenkins *et al.* described the evaluation of lines as sources of resistance to *H. turcicum* at Beltsville, Md., by testing the F_2 progenies of crosses of the lines with susceptible testers. According to the mean ratings of the progenies, CI90A, CI88A and Wh49971 showed most promise. R. R. Nelson reported that in N. Carolina preliminary tests of inbreds and single hybrids for reaction to stunt, root-knot and meadow nematodes suggested that a few lines possess true resistance; genetical studies and breeding are also being carried out on resistance to *H. maydis*.

In the discussion on the terminology and production of male-sterile material, resolutions were moved in favour of using (1) *cms* instead of *cs* to denote cytoplasmic male sterility and a number instead of a letter to signify the particular source of sterility, and (2) *Rf* for a pollen-restoring factor, followed by a number for each nonallele.

L. M. Josephson and H. C. Kincer described breeding for early-maturing high-yielding hybrids at the Tennessee Agricultural Experiment Station. JCB inbred lines developed from crosses between Corn-Belt yellow single hybrids and local white inbreds have been tested in crosses. Hybrids of S_3 and S_4 lines from such crosses have been equal to, and under dry conditions, superior to full-season hybrids. Combinations of the type JCB single hybrid ♀ x Corn-Belt single hybrid ♂ have in general given a better performance than hybrids composed entirely of JCB lines. Among hybrids involving full-season prolific single crosses and Corn-Belt single crosses, T3742 [(T115 x T111) x (K41 x K44)] shows promise as an early hybrid and will probably be released. Encouraging results have been obtained in yield tests of hybrids whose production involves the use of cytoplasmic male sterility and pollen-restoring factors.

L. F. Bauman spoke of his research on epistasis. Epistatic deviations had been highly significant for ear height but non-significant for yield.

G. A. Lebedeff presented a paper on investigations showing that the various degrees of looseness or wrinkling of the pericarp depend upon multiple factors.

E. S. Horner reported that three cycles of selection for combining ability with the single cross F44 x F6 had been completed at the Florida Station. Average test-cross yields for the first, second and third cycles were respectively 93, 95 and 107% of the control Dixie 18. An experiment in which recurrent selection for specific combining ability is being compared with recurrent selection for general combining ability is also in progress. Fla. 5002 was frequently superior in yield to Dixie 18 in tests in Florida and other states during 1955. Fla. 5002 is a product of recurrent selection for combining ability with F44 x F6, seed having been obtained by pollinating this single hybrid with bulked pollen of 10 selected third-cycle lines. P. Harvey expressed dissatisfaction with the results of recurrent selection in North Carolina; possibly lack of a consistent upward trend in yield was partly due to the effect of locality.

The report of the committee on the uniform designation of hybrids includes information on the performance of a number of Dixie hybrids such as Dixie 55 (Miss. 1123), Dixie 29 (Tenn. 29) and Dixie 82.

Inbred lines undergoing conversion to pollen-sterile and pollen-restoring counterparts at the various stations are listed, data being provided on the sources of genes for restoring pollen fertility and the effects of male-sterile cytoplasm upon pollen production. In most cases Texas Golden June was the original source of the male-sterile cytoplasm.

1718 SCHNELL, W.
Ergebnisse der Vorfilter-Maisversuche 1956. **(The results of the 1956 screening trials of maize).**
Saatgutwirtschaft 1956 : **8** : 311–14.

The results of trials to test the suitability of a number of American, Italian, Dutch, Hungarian and South African hybrids for cultivation in Germany are presented, together with tabulated data on maturity groups.

1719 Cikov, D. K.
(The utilization of heterosis in domestic plants).
Priroda (Nature), Leningrad 1956 : No. 9 : 68–70. [Russian].

This report deals with Bulgarian investigations of heterosis in maize, hemp, tomato, egg plants and *Capsicum*. Varieties which give heterotic hybrids are described (cf. *PBA*, XXVI, Absts. 1842 and 2071).

1720 Stein, O. L.
A comparison of embryonic growth rates in two inbreds of *Zea mays* L. and their reciprocal hybrids.
Growth 1956 : **20** : 37–50.

Investigations were carried out on the inbreds A96 and A148 and their reciprocal hybrids. Both hybrids exhibited heterosis in rate of scutellum elongation at the time of the first measurements. Subsequently the rate of elongation was similar in the hybrids and inbreds. A148 x A96 merely maintained its initial advantage but in the reciprocal cross this advantage was enhanced by virtue of a longer duration of scutellar growth. Heterosis was not detected in the width of the scutellum or in rate of initiation of the leaf primordia. Both hybrids were however heterotic as regards the age at which homologous leaf primordia were initiated. A96 terminated its embryonic growth at the fifth-leaf stage but in A148 and the hybrids maturation occurred at the sixth-leaf stage; it is suggested that the longer duration of growth in the hybrids was not due to heterosis but to dominance of A148 in this respect.

1721 Bianchi, A.
Defective endosperm mutants from maize-teosinte derivatives.
Genetics 1956 : **41** : 634–35. (Abst.).

The heterogeneity shown in the segregation of the defective-endosperm (de^t) mutants found among maize-teosinte derivatives may possibly arise through mutability of the de^t genes, disparities in genetic background or differential fertilization.

Seed weights of the mutants, expressed as percentages of normal sib seeds, range from 2–8% for de^{t12}, de^{t21} and de^{t13} to 62–72% for de^{t19} and de^{t22}. Germination does not appear to be a simple function of the weight of the defective kernels. Some of the de^t genes interact with su_1. The mutations de^{t1}, de^{t2}, de^{t3}, de^{t20} and de^{t22} are situated on chromosome 4; de^{t1} and de^{t2} are closely linked and when combined behave as balanced lethals; de^{t2} and de^{t3} appear to be allelic. Linkage has been found between (1) de^{11} and lg_1, (2) de^{t23} and gl_1, (3) de^{t26} and *pr*, and (4) de^{t28} and y_1. The defective mutants do not show regular association with any chromosome aberrations.

1722 Galinat, W. C., Mangelsdorf, P. C. & Pierson, L.
Estimates of teosinte introgression in archeological maize.
Bot. Mus. Leafl. Harv. 1956 : **17** : 101–24.

A number of cobs, 500–700 years old, from Tonto and Richards' Caves in Arizona, resembled maize x teosinte hybrids in appearance, in amount of lignified tissue and in specific gravity. The amount of teosinte introgression, estimated on the basis of the degree of lignification, was directly correlated with row number and diameter and length of cob in the Tonto collection. In the Richards' Caves material, teosinte introgression was associated with both long and short cobs, indicating that hybridization may give rise either to heterosis or to a detrimental effect, the latter possibly as a result of the homozygous expression of teosinte germ plasm. There was evidence suggesting that introgression modifies the expression of genes for fasciation in such a way that they increase row numbers without causing a flattening of the rachis.

1723 Emmerling, M. H.
Unequal crossing over between elements of the *R* complex in *Zea mays.*
Genetics 1956 : **41** : p. 641. (Abst.).

As previously reported, the occurrence of unequal crossing over within R^r has shown that this locus involves two closely linked components, (*P*) and (*S*), which retain their synaptic homology (cf. *PBA*, XXIV, Abst. 2896). On the assumption that (*P*) and (*S*), which affect plant and seed colour respectively, pair indiscriminately, two types of derivatives may be expected if unequal crossing over occurs in (*P*) (*S*) homozygotes: the deficiency cross-overs (*P*) (—) and (—) (*S*), and duplication cross-overs (*P*) (*S*) (*S*) and (*P*) (*P*) (*S*). The two classes of deficiency cross-overs have been identified in stocks marked at loci on either side of locus *R*. Mutation of R^r to R^g involved a change to either (*p*) (*S*) or (—) (*S*). These plant-colour mutants gave rise in turn to seed-colour mutants of the types (P) (—), (*P*) (*s*), (*p*) (—), (*p*) (*s*) and (—) (*s*).

1724 RAHMAN, O. & BROWN, A. H.
Some phenotypic effects of single gene mutations on respiratory characteristics of maize leaf tissue.
Plant Physiol. 1956 : **31** : 408–10.

Investigations were carried out on the respiratory properties of the tissue of the detached third leaf of three isogenic lines representing normal maize and the mutants dwarf–1 and brachytic–2 respectively. In most properties the mutants were similar to the normal line. The three lines differed however in rate of O_2 uptake, rate of CO_2 production under aerobic conditions and RQ value. Compared with the normal line, dwarf–1 showed a greater stimulation of O_2 consumption in response to succinate and brachytic–2 a lower stimulation in response to glucose when these substances were added to the substrate.

1725 WOOD, D. R. & BRINK, R. A.
Frequency of somatic mutation to self color in maize plants homozygous and heterozygous for variegated pericarp.
Proc. nat. Acad. Sci. USA 1956 : **42** : 514–19.

Previous investigations have indicated that the allele P^{W} for variegated pericarp and cob comprises the gene P^{rr} and modulator (Mp), mutation of variegated to self colour involving removal of Mp from the locus P, usually as the result of transposition to another site in the genome; it has also been found that the presence of one or more transposed Mp components in plants with variegated pericarp and cob markedly reduces the frequency of mutation from variegated to self colour (cf. *PBA*, XXIII, Abst. 1171 and XXV, Abst. 1047). The effect of Mp on the stability of $\overline{P^{rr}Mp}$ (= P^{W}) in somatic tissue was studied in the following otherwise nearly isogenic genotypes: (1) "medium variegated" ($\overline{P^{rr}Mp}/P^{wr}$); (2) "light variegated" ($\overline{P^{rr}Mp}/P^{wr}$ + transposed Mp/—); and (3) "homozygous variegated" ($\overline{P^{rr}Mp}/\overline{P^{rr}Mp}$). P^{wr} is a stable allele for colourless pericarp and red cob. The frequency of mutation to self colour in genotype (1) was about 1·6 times as high as in genotype (3) and almost exactly twice as high in (3) as in (2). It is therefore postulated that the Mp component of one allele acts as a transposed Mp with respect to the other allele and that the modifying effect of Mp upon the frequency of mutation to P^{rr} is independent of its situation in the genome.

1726 MESA BERNAL, D.
Consideraciones generales sobre el cultivo del maíz. (**General considerations on maize cultivation**).
Agricultura trop. 1956 : **12** : 723–32.

Reference is made to the wide range of types that had been selected by the aboriginal cultivators of maize in America; the actual location of its centre of origin remains in doubt but the antiquity of its cultivation in America is shown by finds dating back at least 5000 years. Some details concerning the cultivation of maize at the time of the conquest are cited from the early chroniclers.

1727 MANGELSDORF, P. C., MACNEISH, R. S. & GALINAT, W. C.
Archaeological evidence on the diffusion and evolution of maize in northeastern Mexico.
Bot. Mus. Leafl. Harv. 1956 : **17** : 125–50.

A high proportion of a collection of cobs ranging in age from 4445 ± 180 to 1800–2200 years old resembled the modern Mexican race Nal–Tel in type but were smaller and more slender and had fewer rows and prominent glumes. The remaining specimens were related to the Mexican races Dzit-Bacal and Breve de Patilla [Patilla Short].

1728 MANGELSDORF, P. C. & LISTER, R. H.
Archaeological evidence on the evolution of maize in northwestern Mexico.
Bot. Mus. Leafl. Harv. 1956 : **17** : 151–78.

The earliest material, of uncertain date, from each of five caves explored was related to the primitive modern Mexican race Chapalote. The type persisted with little change except increase in size until 750 ± 250 AD when two new forms, an eight-rowed maize from South America and a tripsacoid maize, appear to have been introduced, leading to the development of a type combining the characteristics of the above three and resembling the modern race Cristalino de Chihuahua [Chihuahua Glassy].

1729 MESA BERNAL, D.
Noticias colombianas sobre el maíz en la época de la colonia. (**Information from Colombia on maize in the colonial period**).
Agricultura trop. 1956 : **12** : 527–31.

MESA BERNAL, D.
Noticias sobre el maíz en Colombia. (**Notes on maize in Colombia**).
Ibid. 1956 : **12** : 571–75.

Data on the importance of maize and methods of cultivation are presented in the first article. In the second, on examining the history of maize growing in Colombia it is found that although it was grown there in pre-Columbian times, grain was also imported from Cuba, Santo Domingo, Jamaica and elsewhere and these introduced forms have probably contributed to the germ plasm of the maize varieties grown in Colombia today. The chief of these, some of them being of great antiquity, are described; they include certain forms described as toxic, an effect more probably due to selenium in the soil than to the properties of the varieties themselves.

1730 FABERGÉ, A. C.
Forecasting the rate of induced marker loss for maize endosperm.
Genetics 1956 : **41** : p. 642. (Abst.).

Since chromosome breaks are produced at a frequency approximately proportional to pachytene length, the rate of loss of a marker due to breakage induced by a given dose of radiation may be predicted from knowledge of the position of the locus on the chromosome arm and of the length of that arm in pachytene maps. By using the constants obtained for the short arm of chromosome 9, roughly correct predictions were obtained for the rates of loss of *A*, *Pr*, *Su* and *R*.

1731 CATCHESIDE, D. G.
The genetics of B chromosomes in maize.
Heredity 1956 : **10** : 345–51.

"Estimates have been made of the rates of non-disjunction of B chromosomes in maize at the second pollen grain division and of preferential fertilisation of the egg by the male gamete with the larger number of chromosomes. The rates of non-disjunction vary between different stocks, but there is no definite evidence that preferential fertilisation varies significantly. There is a strong probability that the second pollen grain division is polarised and a possibility that the resulting arrangement of the two male gametes determined preferential fertilisation."
[Author's summary].

1732 BLACKWOOD, M.
The inheritance of B chromosomes in *Zea mays*.
Heredity 1956 : **10** : 353–66.

Investigations have been made at the Botany School, Cambridge, with a view to assessing the effects of nondisjunction and preferential fertilization on the maintenance of B chromosomes in the population. During mitosis irregularities in the behaviour of the B chromosomes were infrequent but, during meiosis, lagging at anaphase I and precocious division occurred, affecting the distribution of B chromosomes to the progenies. Chromosome nondisjunction at anaphase I in the pollen mother cells and chromatid nondisjunction at the second division of the pollen grain nucleus were observed but the rates of nondisjunction were found to vary in different plants. This may be due either to differences in the A genotype controlling the rate and time of nondisjunction or to differences between the B chromosomes. The occurrence of preferential fertilization was confirmed but no population gain of B chromosomes was found. It is suggested therefore that the presence of B chromosomes is disadvantageous.

1733 CATCHESIDE, D. G.
Double reduction and numerical non-disjunction in tetraploid maize.
Heredity 1956 : **10** : 205–18.

In studies of the *su*–1 locus on chromosome 4 in tetraploid material in which the ten different chromosomes could be identified at mitosis, the following components of variation in tetraploid segregation could be distinguished: (*a*) normal chromosome segregation; (*b*) chromatid segregation, in which two chromatids from one chromosome are contributed to a single gamete; and (*c*) numerical nondisjunction, in which the gamete receives one or three of one kind of chromosome, leading to unbalanced chromosome complements in the progenies. From triplex, duplex and simplex data together, the frequencies of chromatid segregation, α, and numerical non-disjunction, x, at the *su*–1 locus gave maximum likelihood estimates of $\alpha = 2{\cdot}4\%$ and $x = 3{\cdot}4\%$.

1734 ŠČELOKOVA, Z. I.
(The hybridization of maize using free selective fertilization).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 2 : 24–28. [Russian].

At Harjkov, white-grained lines and single-cross hybrids were fertilized by self pollen and the pollen of a yellow-grained line, single-cross hybrid or variety. The foreign pollen was used together with the self pollen or two or five hours afterwards. Data on the percentage of xenia and on pollen preference for each mother plant are presented. For instance, the single-cross hybrid 26 x 27 preferred the pollen of another single-cross hybrid 4 x 7 to self pollen and showed a high percentage of xenia. The resultant double-cross hybrid outyielded VIR25, the standard double-cross hybrid in the Harjkov province. It is concluded that by applying the principle of pollen selection this double cross and other high yielding hybrids might be produced without detasseling the female parent. The results of experiments along these lines involving intervarietal hybridization are reported.

1735 ŠČELOKOVA, Z. I. & ČŽOU [CHOU], L.K.
(Selectivity of fertilization in inbred lines, hybrids and varieties of maize).
Agrobiologija (Agrobiology) 1956 : No. 3 : 3–10. [Russian].

At Harjkov a number of white-grained inbred lines, single-cross hybrids and varieties were each fertilized by self pollen + foreign pollen of a yellow-grained inbred line, single-cross hybrid or variety. The foreign pollen was either mixed with the self pollen or used separately two or five hours after selfing. The percentages of xenia for each pair of components and each pollination method are given and discussed. Some of the F_2 plants raised from white grains were hybrids and the percentage of these for each of the above treatments is given.

1736 **(Sterile pollen of maize hybrids).**
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 4 : p. 22. [Russian].

Work on the production of male-sterile lines at Krasnodar is referred to.

1737 **Male sterility in maize and its use in commercial hybrid maize seed production.**
J. Aust. Inst. agric. Sci. 1956 : **22** : p. 226.

The development of the use of male sterility in breeding is described, particular reference being made to work at the Lawes Breeding Station, Queensland.

1738 DUVICK, D. N.
Allelism and comparative genetics of fertility restoration of cytoplasmically pollen sterile maize.
Genetics 1956 : **41** : 544–65.

The five inbred lines Ky21, K55, BH2, F5DD1 and WG3 were found to have the same alleles of the major gene or genes required to restore pollen fertility to the cytoplasmically male-sterile line WF9^{T} but gave different back-cross segregation ratios when other inbred lines carrying the same cytoplasmic male sterility were used as the recurrent parent. This indicated that lines which are rendered sterile by T cytoplasm are not necessarily isogenic at the fertility-restoring loci. The expression of the fertility-restoring genes in segregating populations showed environmental variation. Preliminary breeding experiments indicate that at least two dominant complementary genes plus one or probably more dominant genes modifying the action of one of the complementary genes are required for full pollen fertility in T cytoplasm when plants are grown in Iowa during rather hot dry summers.

1739 BRINK, R. A.
A regularly reversible change in determinative action at the R locus in maize.
Genetics 1956 : **41** : p. 636. (Abst.).

"*R* male gametes from *RR* (self-colored aleurone) plants in an inbred line produce a darkly mottled aleurone in testcrosses with *rr* (colorless aleurone); all the *R* male gametes from RR^{st} (heterozygous stippled) sibs, on the other hand, give weakly colored, or sometimes colorless, aleurone in the same testcross. R^{st} male gametes from $R^{st}R^{st}$ and RR^{st} individuals in testcrosses with *rr* are alike in effect on endosperm phenotype. *RR* progeny of selfed RR^{st} heterozygotes regularly show the darkly mottled phenotype in testcrosses with *rr*. The modified form of *R* and RR^{st} plants persists for at least one generation in *Rr* plants from *rr* ♀ x RR^{st} ♂ crosses, and thus is propagated in the sporophyte as well as in the gametophytes and endosperm. An *R* which has regained normal pigment-producing action in a derived *RR* plant, after having been altered in determinative action in an RR^{st} heterozygote, retains its normal action in *Rr* testcross progeny, and appears to be stable. No unusual properties of the *R* allele in question have been observed except in association with R^{st}."

1740 KAVANAGH, L. R.
The sowing of hybrid maize. Results of trials as a guide to growers.
Agric. Gaz. NSW 1956 : **67** : 360–65.

The results of trials of maize hybrids for yield of grain or fodder and silage in different localities in New South Wales during the season 1954–55 are summarized. Previously only late-maturing and early-maturing hybrids have been available. A mid-season hybrid, GM211, is however shortly to be put on the market. A special feature of the hybrid is its resistance to leaf blight.

1741 HERD, G. W.
Maize diseases during the 1954/55 season.
Rhod. agric. J. 1956 : **53** : 525–37.

Disease ratings are given showing the reaction of 63 imported maize strains and varieties inoculated with *Helminthosporium turcicum* and of 87 single crosses, 33 double crosses and five open-pollinated varieties exposed to natural infection at the Agricultural Experiment Station, Salisbury. All but two of the Natal inbreds compared favourably with the most resistant S. Rhodesian inbred N3–2–3–3, the exceptions being 4–42(3–1571)A508H and 4–51(3–1582)A691H. Data are also provided on the incidence of *Puccinia polysora* and maize streak virus on 59 imported lines tested at the Sabi Valley Experiment Station, and a further table shows the percentage streak infection in 79 inbreds and hybrids. Apparent resistance to streak virus was found in AFRO235, Sicaragua, KO5, NA, NB, KI1 and KVI.1. Further tests will be made with these lines.

1742 **Raising corn's earworm resistance.**
Agric. Res., Wash. 1956 : **5** : No. 5 : 3–4.

Recent progress made in developing maize and sweet corn with resistance to *Heliothis armigera* is described.

1743 Urano, K. & Arai, Y.
(**Studies on the diagnosis of relationships between maize strains using the precipitin reaction. III. The relation between protein fractions and the precipitin reaction**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **25** : 28–29. [Japanese].

Further to the researches summarized in *PBA*, XXVI, Absts. 3291–2, the authors separated the protein of the pollen of Reid's Early Yellow maize into four fractions: total protein, albumin + globulins α and β, albumin + globulin α and albumin. Antisera to each of these fractions were produced in rabbits and tested back to the antigens by the ring test. The intensity of reaction declined with the four fractions in the order quoted.

1744 Urano, K. & Arai, Y.
(**Studies on the diagnosis of relationships between maize strains using the precipitin reaction. IV. The relation between the quantity of protein used for immunizing and the precipitin reaction**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **25** : 29–30. [Japanese].

Using the same variety as in Abst. 1743, it was shown that the precipitin reaction became clearer as the quantity of antigen increased.

1745 Urano, K. & Arai, Y.
(**Studies on the diagnosis of relationships between maize strains using the precipitin reaction. V. On the proportionality between heterosis in crosses of inbred lines and the precipitin test**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **25** : 30–32. [Japanese].

The degree of heterosis in nine single crosses between inbred lines was determined and compared with the precipitin reaction of each combination (cf. Absts. 1743–44). A negative correlation between degree of heterosis and quantity of precipitate was established.

BARLEY

1746 Bilquez, A.
Existence, chez les végétaux supérieurs, de plusieurs modes de comportement vis-à-vis du rayonnement X. (**Existence, in higher plants, of several modes of behaviour towards X irradiation**).
CR Acad. Agric. Fr. 1956 : **42** : 559–60.

Lethal effects and mitotic disturbances caused by X irradiation of barley seeds decreased with increasing water content (cf. *PBA*, XXV, Abst. 3054) but, in the case of seeds of *Crepis zacintha*, the reverse held true.

1747 **Report of the Seed Propagation Division, 1954.**
J. Dep. Agric. Éire 1955–56 : **52** : 146–55.

The report summarizes the results of (1) trials of Spratt Archer x Kenia selections and other barleys and (2) the European Brewery Convention test of six barleys in the Irish Republic.

1748 Elliott, C. S. & Burrell, W. D.
Spring barley variety trials, 1948-53.
J. nat. Inst. agric. Bot. 1956 : **7** : 551–64.

The results are reported of trials at 21 localities from 1948–53 of recently introduced Scandinavian varieties, new varieties produced in this country by crosses between English and Scandinavian varieties, including some unnamed breeders' selections and the older variety Gold. Data are provided on the grain yields of all varieties and other characters such as straw length and strength, time of maturity, disease incidence and grain quality are discussed for the more important varieties included. Proctor was outstanding and Carlsberg, Maythorpe, Provost, Herta and Rika were promising.

1749 Moës, A.
La nouvelle variété d'orge d'hiver Manon. **(The new winter barley variety Manon).**
Rev. Agric., Brux. 1956 : **9** : 1056–58.

Manon, a new winter barley developed at the Gembloux Plant Breeding Station, Belgium, from a cross between Bordia and the Gembloux strain 185, outyields Bordia by approximately 20% and possesses better resistance to frost and *Ustilago nuda*. It has short, stiff straw and responds well to high applications of nitrogen fertilizer without lodging.

1750 Woodward, R. W. & Dix, D. C.
Alpine—new winter barley.
Fm. Home Sci. 1956 : **17** : 60–61, 72.

Alpine barley, [(Coast x Lion) x Winter Club] x Purdue 21, recommended for both dry and irrigated farms in Utah, is a semi-club, rough-awned variety with white kernels. It is tall but has sufficient straw strength to resist lodging. It survives winter conditions better than Winter Club and gives higher yields than this variety.

1751 Takahashi, R.
(Studies on the classification and the geographical distribution of Japanese barley varieties. V. The inheritance of coleoptile length and its significance for breeding).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1948 : **37** : 102–08. [Japanese].

An English version of this paper was summarized in *PBA*, XXII, Abst. 2703.

1752 Takahashi, R.
(Studies on the classification and distribution of Japanese barley varieties. VI. The distribution of the genes for rachilla type).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1948 : **37** : 132–36. [Japanese].

Data are provided on the distribution of *Ss* (long *v.* short rachilla hairs) among Far Eastern, Near Eastern, European and American varieties and within Japan. The relationship between rachilla hair length and other characteristics, in particular row number and spike density, is also considered.

1753 Takahashi, R., Yamamoto, J. & Itano, Y.
(Studies on the classification and geographical distribution of Japanese barley varieties. VII. On the pubescence of the leaf sheath).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1948 : **38** : 5–10. [Japanese].

Data are provided on the various types of pubescence and on the geographical distribution of pubescent and glabrous forms throughout the world and in particular in Japan and Korea. The frequency with which pubescent and glabrous forms occur in hulled and naked barleys respectively is also examined. A series of crosses of Far Eastern varieties showed that the determination of pubescent *v.* glabrous leaf sheaths depends on a single gene pair, pubescence being dominant.

1754 Takahashi, R. & Yamamoto, J.
(Studies on the classification and geographical distribution of barley varieties. VIII. On disarticulation of the spikelets).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1949 : **38** : 41–43. [Japanese].

Cf. *PBA*, XXIII, Abst. 1950.

1755 Takahashi, R.
(Studies on the classification and geographical distribution of barley varieties. IX. Differences in awns. 1).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1949 : **38** : 77–80. [Japanese].

The literature on the genetical determination of presence or absence of awns and of awn length in the central and lateral rows of the spike is reviewed. Data on the geographical distribution of these awn characteristics are also assembled and the author adds some further information on awn length in Japanese varieties and its relation to the hulled or naked condition and to other features of the inflorescence.

1756 Takahashi, R. & Yamamoto, J.
(Studies on the classification and geographical distribution of barley varieties. X. Differences in awns. 2).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1949 : **38** : 152–56. [Japanese].

Information on the genetics and geographical distribution of awn length and the various types of hooded barley is reviewed and further data are added on the distribution of these characteristics in Far Eastern barleys.

1757 Takahashi, R. & Yamamoto, J.
(Studies on the classification and geographical distribution of barley varieties. XI. Awn roughness and glume size).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1949 : **38** : 157–60. [Japanese].

The literature on the genetics and geographical distribution of the above two characteristics is reviewed.

1758 TAKAHASHI, R. & YAMAMOTO, J.
(Studies on the classification and geographical distribution of barley varieties. XII. On the pigmentation of the plant parts).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1950 : **39** : 25–32. [Japanese].

Published data on the genetics and geographical distribution of melanic pigmentation, blue aleurone and anthocyanin pigmentation, in particular of the awn, glume, grain, auricle and ligule, are reviewed. The author adds some tabular information on the geographical distribution of aleurone colour and awn pigmentation among hulled and naked barleys, especially Far Eastern varieties.

1759 TAKAHASHI, R. & YAMAMOTO, J.
(Studies on the classification and geographical distribution of barley varieties. XIII. On the hulled *v.* naked condition).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1950 : **39** : 32–36. [Japanese].

A review of information on the genetics and geographical distribution of the above characteristic is given, also some data on correlations between this feature and other characteristics of the spike.

1760 TAKAHASHI, R., YAMAMOTO, J. & MARUHASHI, W.
(Studies on the classification and geographical distribution of barley varieties. XIV. The linkage relations of the semibrachytic gene and its geographical distribution).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1950 : **39** : 57–62. [Japanese].

Cf. *PBA*, XXII, Abst. 2704.

1761 TAKAHASHI, R. & YAMAMOTO, J.
(Studies on the classification and geographical distribution of barley varieties. XV. The type of disarticulation of the spikelet and the phylogeny of cultivated barley).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1951 : **39** : 81–90. [Japanese].

A full account of the researches referred to in *PBA*, XXIII, Abst. 1950 is given.

1762 HOLMGREN, P.
Some observations on the amount of protein and nonprotein nitrogen in two pigment mutations of barley.
Kungl. LantbrHögskolans Ann. 1956 : **22** : 353–57.

Albina seedlings contained about 2% of the amount of pigment found in normal green plants and had fewer and smaller plastids, less protein and more free aminoacids. Xantha seedlings had plastids of the normal size and had normal protein and aminoacid contents but lacked chlorophyll b and contained 15% and 80% of the normal amounts of chlorophyll a and carotenoids respectively. It is suggested that a genetic block of the synthesis of plastid protein has occurred in the albina mutant and of chlorophyll synthesis in the xantha mutant.

1763 TAKAHASHI, R. & YAMAMOTO, J.
(The genetics and linkage of semi-brachytic habit and fragile stem in barley).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1951 : **39** : 126–30. [Japanese].

English versions of the two parts composing this paper are summarized in *PBA*, XXII, Abst. 2704 and XXVI, Abst. 410, respectively.

1764 TAKAHASHI, R., YAMAMOTO, J., YASUDA, S. & SHIOJIRI, I.
(Studies on linkage in barley, in particular on genes in linkage groups I and II).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1952 : **40** : 131–36. [Japanese].

An English version of this article forms part of the paper summarized in *PBA*, XXVI, Abst. 410.

1765 AZIZ, M. A.
Occurrence of profusely tillering and many noded dwarf plants in an inter-specific cross of barley.
Agriculture, Pakistan 1955 (1956) : **6** : No. 2 : p. 28.

A cross made between Punjab Barley T4, which is six rowed, and 1–0624, a two-rowed variety, gave an F_1 intermediate between the two parents and an F_2 which included some dwarf plants with a larger number of nodes and tillers than either parent. The ears were branched and two rowed, intermediate or six rowed; they had few spikelets, almost all of which were sterile. It is suggested that the dwarf character is recessive and trifactorially determined.

1766 OSIPOV, A. E.
(Using vegetative hybridization in breeding graminaceous crops).
Agrobiologija (Agrobiology) 1956 : No. 3: 78–88. [Russian].

An account of intervarietal, interspecific and intergeneric graft hybridization at the Rjazanj Breeding Station, involving *Triticum*, *Avena*, *Secale*, *Hordeum*, *Oryza* and grass species such as *Bromus* and *Elymus* is given, and the following topics are discussed: grafting methods; the effects of the stock upon the morphological and biological properties of the scion; heritable changes and the mode of segregation in the first and succeeding seed generations; relations between environment and inheritance of dominant and recessive characters in vegetative hybrids; and sterility in graft hybrids between distant species. Among the practical achievements are the following new barley forms selected among the fifth and sixth seed generations of the vegetative barley hybrid Pallidum 45/Furkatnyĭ [Furcate]: the hulled barley V 402, which outyields Pallidum 45 by 5·7 c. per ha. and has larger grain; and V361, V11/1, V11/11, V8 and V15, which are distinguished by naked seed and high 1000-grain weights, although their grain yields are below Pallidum 45. Most recent selections have more grain per ear and larger grain than either component of the graft. Their ears are also more productive than those of the standard for the Rjazanj province.

1767 Zomergerst, 1957. **(Spring barley, 1957).**
Landbouwvoorlichting 13 : Bijl. 16; Ber. Rassenkeuze 1956 : No. 213 : Pp. 4.

The results are presented of trials of 17 malting and fodder varieties at different centres and on different types of soil in the Netherlands in 1956 and recommendations are made as to the best varieties for cultivation in 1957.

1768 Bahteev, F. H.
(A form of cultivated barley, *Hordeum lagunculiforme* michi, recovered by excavation).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **110** : 153–55. [Russian].

Barley grains dating back to the third or second century B.C. found in the Crimea, Armenia and Azerbaĭdžan are reported to have pedicellate spikelets. Hence it is thought that the ancestral form of cultivated barley cannot be *H. spontaneum* or *H. agriocrithon* which both have sessile spikelets.

1769 Burnham, C. R. & Hagberg, A.
Cytogenetic notes on chromosomal interchanges in barley.
Hereditas, Lund 1956 : **42** : 467–82.

Data on the frequencies of breakage in the different chromosomes of the six-rowed barley Mars, as obtained by the study of 27 interchanges, suggest that breakage occurs more often in chromosome b than in any of the others. In the two-rowed varieties Gull [Golden], Maja and Bonus, marked interchromosomal differences in frequency of breakage were not however detected in an analysis of 13 interchanges. Mars and the group of two-rowed barleys also showed disparities in the frequencies of the different interchanges possible. The notation 1 to 7 is proposed for the chromosomes of barley, the correspondence of the various systems employed to denote the chromosomes and linkage groups being indicated. Notes on the methods found most efficient by the senior author in using interchanges in linkage tests are given. Linkage maps and a list of symbols for the genes mapped and the corresponding characters are also provided for the sake of convenience. Based on information from root-tip squashes, at least one interchange marking each chromosome arm and the satellites has now been established for chromosomes a, b, d and g. In the case of either c or f, an interchange probably marking one arm only is available. Interchange analysis likely to further the completion of the task of finding markers for the different arms of all seven chromosomes are suggested.

1770 Takahashi, R. & Yamamoto, J.
(The physiology of earing in cereals and its genetics. I. The genetics and linkage of sensitivity to light in barley).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1951 : **40** : 13–24. [Japanese].

Cf. Abst. 1773

1771 Takahashi, R., Yasuda, S., Yamamoto, J. & Shiojiri, I.
(The physiology of earing in cereals and its genetics. II. Gene analysis of two kinds of spring-barley varieties).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1953 : **40** : 157–68. [Japanese].

Cf. Abst. 1773.

1772 Takahashi, R., Yasuda, S., Yamamoto, J. & Shiojiri, I.
(The physiology of earing in cereals and its genetics. III. The genetical types of spring habit in barley).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Biol. 1954 : **41** : 87–96. [Japanese].

Cf. Abst. 1773.

1773 Takahashi, R. & Yasuda, S.
Genetic studies of spring and winter habit of growth in barley.
Ber. Ōhara Inst. 1956 : **10** : 245–308.

Over 90 crosses, grown under 24 hr. illumination, were analysed to elucidate the genetics of spring *v.* winter habit. Three major genes, *sh*, Sh_2 and Sh_3 are responsible for spring habit, any one of which or any combination of which determines spring habit. Winter habit is only expressed by $ShShsh_2sh_2sh_3sh_3$ or $Shshsh_2sh_2sh_3sh_3$.

Sh is linked with *Hs* (sheath hairiness) with a recombination value of 6·4%. Sh_2 is in linkage group V; its recombination values with the *S* (rachilla hair length) and *R* (awn roughness) loci are 20–38·5 and 14% respectively.

The Sh_2 gene is differentiated into a series of multiple alleles, Sh_2^{I}, Sh_2^{II} etc., with differential effects on the length of the vegetative period. Other genes having a minor effect on the length of the vegetative period were also detected.

Sh_2 is widely distributed and is thought to have been derived from *Hordeum agriocrithon*; *sh* is mainly found in western Eurasia and Sh_3 in northern Europe.

1774 Truhinova, A. T.
(Changing a nonoverwintering spring barley into one that overwinters).
Agrobiologija (Agrobiology) 1956 : No. 3 : 58–64. [Russian].

An alternative variety Moscow was obtained by sowing the spring barley Pallidum 32 as a winter cereal at Gorki Leninskie. Some plants, characterized by prostrate habit and different leaf colour, overwintered in the first year; their hardiness was further improved by autumn sowing for two successive generations. This material, when sown as a spring barley, eared at the same time as Pallidum 32, but, when sown as a winter crop, many plants overwintered well. Photoperiodic investigations in barleys have shown that in the case of Moscow its photoperiodic requirements are such that in Moscow province its development is checked before the formation of ear primordia and this accounts for its hardiness.

1775 Skripčinskiĭ, V. V.
(Some characteristics of phasic development of different barley varieties which ensure their safe overwintering).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **109** : 1210–13. [Russian].

Observations at Stavropolj on the effects of temperatures at vernalization and of short autumn days upon growth and development of some barleys are presented. It is thought that spring barley varieties comprise biotypes different with regard to their photoperiodic requirements and that the biotypes unable to pass through the light phase in short days may be better equipped for survival in the winter than others. It is suggested that experiments on changing spring into winter crops may be explained by natural selection of hardy spring types.

1776 Sawicki, J.
Unerwienie pochewki kiełkowej u jęczmienia *Hordeum sativum* Jess. i znaczenie tej cechy dla odmianoznawstwa i hodowli. **(The nervation of the coleoptile in *H. sativum* Jess. and the importance of this character in varietal determination and breeding).**
Acta agrobot., Warszawa 1955 : **3** : 129–66.

In a study of the number of vascular bundles in the coleoptile, 250 barley varieties in a world collection were found to fall into two main types: (1) those with two bundles only and (2) those with two or more bundles. Plants of type (2) were subject to environmental variation but when grown under the same conditions they could be subdivided into (*a*) those with 2–4 bundles, most of the plants having two and (*b*) those with 2–6, mostly with more than two. Varietal differences in number of bundles and range of variation were observed.

1777 Takahashi, R., Yamamoto, J. & Yasuda, S.
(The genetics of semisterility in barley arising from an aberrant stigma).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Biol. 1953 : **41** : 69–78. [Japanese].

A type of semisterility due to defective development of the stigma is described; it originated in the variety Aohadaka [Blue Naked]. Hybridization experiments between the aberrant form and the varieties Colsess I and Miyagi 123 showed that the defect was caused by a recessive gene denoted u_4. This gene is a member of linkage group III, being very close to *lk*; its cross-over values with *n* and *l* are 8 and 25% respectively.

1778 Schuphan, W. & Postel, W.
Studien über exogene Aminosäuren im Eiweiss von Gerstencaryopsen unter dem Einfluss genetischer und ökologischer Faktoren. **(Studies on exogenous aminoacids in the protein of barley caryopses under the influence of genetical and ecological factors).**
Naturwissenschaften 1956 : **43** : p. 473.

Varietal differences in the amount of aminoacids present in the protein of the barley caryopsis were ascertained in laboratory tests at the Federal Institute for Research on the Quality of Plant Products, Geisenheim, Germany (cf. Abst. 1779). The influence of environmental factors such as weather and amount of fertilizer applied was, however, greater than the influence of variety and frequently masked the latter. Positive correlations were established between protein content, total content of aminoacids and phenylalanine content.

1779 Postel, W.
Der Einfluss genetischer und ökologischer Faktoren auf den Eiweisshaushalt von Sommergerstencaryopsen, unter besonderer Berücksichtigung der exogenen Aminosäuren. (The influence of genetical and ecological factors on the protein economy of the caryopses of spring barleys with special reference to exogenous aminoacids).
Züchter 1956 : **26** : 211–39.

Studies on the effect of climate and nitrogen fertilizer on the protein contents and aminoacid contents of a number of German and foreign spring barleys (cf. Abst. 1778) showed that, although differences existed between varieties in protein content and amount of aminoacids present, these differences were small in comparison with differences caused by environmental factors.

1780 Takahashi, R. & Itano, Y.
(Studies on barley hoods. I. The genetics of elevated hoods).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1952 : **40** : 57–60. [Japanese].

Cf. *PBA*, XXVI, Abst. 410.

1781 Takahashi, R. & Itano, Y.
(The relations between the characteristics of the awn in Japanese barleys and the ash content of the awn).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1947 : **37** : 5–6. [Japanese].

The effects of the three loci, *Hh*, *Ee* and *Aa*, which affect the length and consistency of the awns, on the ash content of the awns were investigated. The content of ash was higher in plants carrying *H*, *a* or *e* than in plants bearing the respective alleles.

1782 Rasmusson, D. C.
The inheritance of certain morphological characters of the barley spike.
Monogr. Ser. Utah St. agric. Coll. 1956 : **4** : No. **4** : 25–26.

Data from an unspecified cross indicated that complementary gene pairs, *Kk* and *Lklk*, controlled hoods and awns, the hooded condition depending upon *K* and *Lk*. As reported by previous workers, the characters of *deficiens vs.* two-rowed (V^tV) and normal *vs.* brachytic ears (*Brbr*) segregated in a simple Mendelian manner. Several pairs of factors determined lax *vs.* dense spikes. The inheritance of alternate *vs.* opposite arrangement of the spikelets (*Opop*) and long *vs.* short glume hairs (*Ghgh*) did not show a good fit to a monofactorial ratio. Independent inheritance was found between (1) *Ghgh*, V^tV and *Brbr*, (2) *Ghgh* and *Opop* and (3) *Kk* or *Lklk* and *Opop*. Linkage of *Brbr* with *Opop* and of *Kk* with *Ghgh* was detected.

1783 Kooi, I. & Nijdam, F. E.
Distinction by grain characters of the two-rowed summer barley varieties on the list of 1955.
Euphytica, Wageningen 1956 : **5** : 157–62.

Five groups could be distinguished among nine two-rowed barleys on the basis of the following characters: hairiness of the rachilla; the occurrence of spicules on lateral nerves of the lemma; the presence of red pigment in the nerves of the lemma; and the presence of fine hairs on the palea along the ventral crease. Within the groups, varieties could be distinguished according to differences in shape and size of the grain.

1784 Sawicki, J.
Zastosowanie metody barwienia ziarna fenolem do oznaczania odmian jęczmienia nagiego. **(The use of the phenol method of staining the grain in identifying varieties of naked barley).**
Acta agrobot., Warszawa 1955 : **3** : 167–77.

On testing 77 varieties of naked barley, including local Carpathian strains, for reaction to Pfuhl's staining method, the colour of the grain 24 hours after treatment with 1% phenol solution was found to be a fairly stable varietal characteristic. Staining of the ventral surface of the grains allowed three groups showing the following colour reactions to be distinguished: (1) little change in colour; (2) dark brown to black coloration; and (3) a mixed reaction including both the above types.

1785 **Report of the Barley Committee of the European Brewery Convention. Trials 1955** (1956) : Pp. 114.

A report is given of the 1955 trials in which the spring barleys Kenia (standard), Busser, Carlsberg II, Domen and Proctor were compared with respect to field performance and properties of the grain and malt, when grown in 13 countries in west Europe. In addition, Beorna, Maythorpe, Weibull 5425 (= Ingrid) and Wisa were tested in most countries. H. van Veldhuizen gives the report of the Barley Committee of the convention, providing a summary of the results of the trials and referring to other activities. F. R. Horne contributes the report of the Sub-committee on New Varieties.

1786 ITANO, Y.
(On the husk percentage of barley varieties).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1948 : **37** : 146–58. [Japanese].

The husk percentage of an extensive series of Japanese and some introduced varieties was determined. Correlations were worked out between husk percentage, on the one hand, and various spikelet characteristics, vegetative period, seedling characteristics and 1000-grain weight, on the other.

1787 STERN, R. & WRIGHT, G. M.
Nitrogen and amylase in some New Zealand barleys.
J. Inst. Brew. 1956 : **62** : 470–77.

The results of an analysis of samples of Kenia and Research grown in north Canterbury during four seasons are reported. Season and locality rather than variety influenced N content. Research had a higher content of total amylase than Kenia, particularly in the drier seasons. It is suggested that a high ratio of total amylase content to N content is likely to be associated with good malting quality and that this ratio therefore deserves consideration in breeding.

1788 **World collection of barley. Data compilation No. 2. Agronomic notes on 283 North African barleys grown at five locations in the Great Plains in 1955.**
US Dep. Agric. 1956 : unpaginated. (Mimeographed).

Tabulated data are given on the dates of heading and ripening, yield and height of North-African barleys tested in Colorado, Kansas and Nebraska.

1789 **World collection of barley. Data compilation No. 3. Disease and agronomic data on 424 Manchurian barleys grown at nine locations in the North Central United States and Manitoba, Canada in 1955.**
US Dep. Agric. 1956 : unpaginated. (Mimeographed).

The results of tests of Manchurian barleys in the USA and Canada are tabulated. Reaction to *Septoria*, powdery mildew and stem rust, maturity, height, tillering and resistance to lodging and shattering are among the characteristics covered.

1790 GOTOH [GOTO], K.
Genetic analysis of varietal differentiation in cereals. III. Competitive ability of local strains of the barley variety "Hosogara No. 2".
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 1–8.

Continuing his studies on intravarietal differentiation in the above variety (cf. *PBA*, XXVI, Absts. 2327–8), the author discovered that samples of diverse provenance differed in competitive ability. High yield tended to be inversely correlated with competitive ability.

1791 NISHIKADO, Y., TAKAHASHI, R. & HIURA, U.
(Studies on the disease resistance of barley varieties. I. Varietal differences in resistance to mildew).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1949 : **38** : 141–51. [Japanese].

Cf. *PBA*, XXII, Abst. 2721.

1792 HIURA, U. & HETA, H.
(Studies on the disease resistance of barley varieties. II. On the physiological races of mildew, *Erysiphe graminis hordei* Marchal).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1952 : **40** : 89–95. [Japanese].

This paper is the preliminary report on the investigations referred to in *PBA*, XXVI,Absts. 421 and 1311.

1793 HIURA, U. & HETA, H.
(Studies on the disease resistance of barley varieties. III. The genetics of resistance to physiological race I of mildew, *Erysiphe graminis hordei* Marchal).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1952 : **40** : 96–102. [Japanese].

Seven crosses between resistant and susceptible varieties were studied in the F_1–F_3. The variety Kairyobozumugi [Improved Bonze] has one incompletely dominant gene for resistance. In Caucasus and *Hordeum spontaneum* var. *nigrum*, resistance is determined by a fully dominant gene. Two complementary genes are responsible for resistance in Mukkadoshibari [Six-rowed Chevalier] and Aizuhadaka 3 [Aizu Naked 3].

1794 HIURA, U. & HETA, H.
(Studies on the disease resistance of barley varieties. IV. Physiological races of mildew collected in 1952 and their geographical distribution).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1952 : **40** : 127–30. [Japanese].

Cf. *PBA*, XXVI, Absts. 421 and 1311.

1795 Hiura, U. & Heta, H.
(Studies on disease resistance in barley. V. Physiological races of mildew collected in 1953 and intervarietal differences in resistance to 10 physiological races).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Biol. 1954 : **41** : 145–56. [Japanese].

Cf. *PBA*, XXVI, Abst. 1311.

1796 Hiura, U. & Heta, H.
(Studies on the disease resistance of barley. On the genes responsible for resistance to mildew).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Biol. 1953 : **41** : 59–68. [Japanese].

After testing a series of varieties for their reaction to races 8B, 8C, 13, 14 and 15 of mildew, the varieties were classified into eight groups in respect of differential reaction to the five races. Three series of crosses were then effected to determine the genetics of resistance to race 13: (1) crosses between the first seven groups, all of which are resistant to some races, and group VIII, which is susceptible to all; (2) intragroup crosses; and (3) intergroup crosses. The following genes were identified in the material studied: Ml_1, resistant to all five races; Ml_2, resistant to races 14 and 15 and partially resistant to 8B and 8C; ml_3, resistant to 8B, 8C, 13 and 15; Ml_4, partially resistant to 8C, 13, 14 and 15; Ml_5, resistant to 13, 14 and 15; ml_6, partially resistant to all five races; and Ml_7, partially resistant to 8B, 8C, 13 and 14.

1797 Hänsel, H. & Zakovsky, J.
Röntgeninduzierte Mutanten der Vollkorngerste (*Hordeum distichum nutans*). I. Bestrahlung und Auslese auf Mehltauresistenz. **[X-ray induced mutants of round-grained barley (*H. distichum* var. *nutans*). I. Irradiation and selection for mildew resistance].**
Bodenkultur 1956 : **9** : 50–64.

Mutants possessing improved resistance to *Erysiphe graminis* were obtained at the Probstdorf Seed Production Station, Austria, by irradiating seeds of *H. distichum* var. *nutans* with 9400 r. The mutants varied widely in their degree of resistance, indicating that the mutant genes were not the same in each case. In no instance was a resistant mutant obtained without some other character, e.g. length of straw or resistance to rust, being affected. Selection for resistance to mildew and other qualities was carried out in the X_1–X_3. In trials in 1955, three of the resistant lines outyielded the initial material by 15–29% under conditions of moderate infection with mildew.

1798 Johnston, W. H. & Metcalfe, D. R.
The history, description and performance of Parkland—a new malting barley.
Agric. Inst. Rev. 1956 : **11** : No. **5** : 11–14, 53.

A detailed description is given of a new malting variety, Parkland, which is being increased for distribution in Canada in 1957. Previously known as Br. 3833, its parentage is [(Newal x Peatland) x OAC21] x (Olli x Montcalm). It is six-rowed, of the Manchurian type, moderately resistant to lodging and late in maturing. Data are provided on the results of trials carried out from 1953–55, in which it proved superior in yield and lodging resistance to Montcalm and OAC21. It is highly resistant to the common races of *Puccinia graminis* but moderately susceptible to *Ustilago hordei* and *U. nuda* (cf. *PBA*, XXVI, Abst. 2326).

1799 Baker, E. P. & McWhirter, K. S.
Systematic status of a leaf rust on *Hordeum leporinum* Link in Australia.
Proc. Linn. Soc. NSW 1955 : **80** : 154–58.

Morphological and pathological studies on a rust species occurring on *H. leporinum* in the Sydney region, New South Wales, are reported. It is pointed out that the nomenclature of this rust as *Puccinia hordei* Fckl. conflicts with the current nomenclature of the dwarf leaf-rust of barley, now known as *P. hordei* Otth., and further contended that the epithet *hordei* for the rust species found on *H. leporinum* has priority. The suggestion that the rust in question be relegated to subspecific status with the name *P. hordei-murini* is discussed and rejected.

1800 Allen, T. C. (Jun.).
Strains of the barley yellow-dwarf virus.
Phytopathology 1956 : **46** : p. 634. (Abst.).

By means of inoculation tests with four differential varieties, sixteen strains of the barley yellow-dwarf virus have been identified.

MILLETS AND SORGHUMS

1801 Petrova, Z. V.
(New Panicum millet varieties).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. **3** : 27–30. [Russian].

Recent selections from various Soviet breeding stations, all notable for high yield and fine quality of grain, are described. Among them Dolinskoe 31 and Kremovoe 311 [Cream 311] show resistance to drought and Veselyĭ Podol 38 to pests and diseases; Veselyĭ Podol 21 is tolerant of salinity; Kamalino 591 and Kamalino 40 are frost resistant and ripen early; Maĭminskoe Mestnoe [Maĭminsk Local] does not lodge or shed grain and Kabarda 559 and Petrovskoe 57 have a tough panicle besides showing resistance to lodging. The last-mentioned variety also shows drought resistance.

1802 Arun Kumar Sharma & De, D. N.
Cytology of some of the millets.
Caryologia 1956 : **8** : 294–308.

The number and morphology of somatic chromosomes has been determined in *Eleusine indica* ($2n = 18$), *E. coracana* ($2n = 36$), *E. aegyptiaca* ($2n = 45$), *Setaria italica* ($2n = 18$), *S. verticillata* ($2n = 18$), *S. glauca* ($2n = 36$), *Pennisetum typhoideum* ($2n = 14$) and *P. orientale* ($2n = 35$). Marked similarities in caryotypes were found within each genus. Investigations of meiosis in *E. aegyptiaca*, *S. glauca* and *P. typhoideum* revealed frequent meiotic irregularities in the last two species but few in the first.

1803 Kaukis, K. & Webster, O. J.
Effects of thermal neutrons on dormant seeds of *Sorghum vulgare* Per.
Agron. J. 1956 : **48** : 401–06.

Plants grown from seeds exposed to doses of thermal neutrons in the range 7·12–38·50 x 10^{12} Nth/cm.^{2} were compared with those from untreated seeds and from seeds subjected to X irradiation. Both types of radiation resulted in a reduction in plant height in both seedlings and mature plants, delayed flowering, increased sterility, a higher frequency of chlorophyll mutants and a greater proportion of chromosome bridges or fragments in root-tip cells; in material irradiated with thermal neutrons, the size of the effect increased in each case with increasing dosage. It is estimated that 1 r. of X rays is equivalent in effect to about 5 x 10^9 Nth/cm.^{2}

1804 Srinivasa Iyengar, G. & Gopala Iyengar, K.
American sorghums in Mysore.
Mysore agric. J. 1956 : **31** : 75–76.

Eight American varieties have been tested over a three-year period in Mysore and compared with a local variety. All matured earlier and gave higher grain yields than the local variety but their yields of stover were considerably lower and their grain colour less acceptable.

1805 Thurman, R. L.
Grain sorghum experiments, 1956.
Mimeogr. Ser. Univ. Ark. agric. Exp. Sta. 1956 : No. 50 : Pp. 4.

On the average the seven Texas F_1 hybrids included in the variety tests reported gave over a 10% higher yield of grain than the open-pollinated controls at Fayetteville and Stuttgart, Ark. Of these hybrids, Texas 610, 590, 620 and 660 gave the best all-round performance.

1806 **New Frontier hybrid sorghum seed.**
Seed World 1956 : **79** : No. 6 : 34–35.

According to the Agricultural Research Association, Hutchinson, Kans., use of the hybrid seed now being distributed in Kansas and other states by Seed Producers, Inc. under the proprietary name of Frontier may be expected to increase grain yields by 25–60% over those obtained from standard varieties. Three hybrids are being distributed: Frontier 390, 400 and 410, with very early, medium-early and medium maturity respectively.

1807 Webster, O. J.
The new sorghum hybrids.
Neb. Exp. Sta. quart. 1956 : **4** : No. 3 : 6–7.

This article provides a popular account of the development of hybrid sorghum at the Nebraska Experiment Station. It is hoped to release the new hybrids after further extensive trials in 1957.

1808 Kramer, N. W. & King, J. G.
Sorghum hybrids are here.
Seed World 1956 : **79** : No. 7 : 8, 10.

Descriptions are given of the hybrids Texas 590, 601, 611, 620, 650 and 660, released by the Texas Agricultural Experiment Station in 1956. They are red-grained combine types similar in appearance to Martin and other widely grown varieties, which they have outyielded by 20–40%. Texas 590 and Texas 601 are early maturing; the remaining five are medium early. The hybrids were produced with the aid of cytoplasmically ♂-sterile lines.

1809 Franzke, C. J. & Ross, J. G.
Colchicine induction of new true-breeding mutants from previously induced true-breeding mutants in sorghum.
Genetics 1956 : **41** : 643–44. (Abst.).

A variety selected from crosses among grain sorghums was treated with colchicine at the South Dakota State College, Brookings. The variety and the types entering into its parentage were approximately the same height. A slightly taller, true-breeding line was immediately obtained from the treated material. Upon treatment of this line with colchicine, two different true-breeding dwarf mutants were produced. Treatment of the two mutants immediately resulted in new true-breeding types, some of which resembled the original untreated variety.

1810 ATKINSON, G. F., ROSS, J. G. & FRANZKE, C. J.
Differential reaction of two varieties of sorghum to colchicine treatment.
Genetics 1956 : **41** : 633–34. (Abst.).

Seedlings of Experimental 3 and Norghum were treated with colchicine. Plants of Experimental 3 surviving to maturity were significantly more variable than untreated plants in awn production, plant height and tiller number. Eighteen of the 43 treated plants, all of which were diploids, were distinct mutants for one or more characters. In Norghum, the treated plants were no more variable than the controls and no mutants were found; three out of the 30 treated plants examined were tetraploid.

1811 VENKATESWARLU, J. & RAMAKRISHNA REDDI, V.
Morphology of the pachytene chromosomes and meiosis in *Sorghum subglabrescens*, a Eu-Sorghum.
J. Indian bot. Soc. 1956 : **35** : 344–56.

After staining with a modified acetocarmine technique, the ten chromosomes of *S. subglabrescens*, all of which were characterized by distinct centromeres, could be distinguished by the varying lengths of the deeply staining proximal regions and of the lightly staining distal regions of the arms. Prophase pairing and diplotene separation took place earlier in the deeply staining than in the lightly staining regions. Chiasmata formation did not appear to be localized in any particular parts of the chromosome.

1812 **Kansas hybrid sorghum has purity, increased yield.**
Sth. Seedsman 1956 : **19** : No. 11 : p. 77.

Frontier, a hybrid sorghum, has been released for Kansas, Missouri, Nebraska, Oklahoma and Colorado by the Agricultural Research Association, Hutchinson, Kansas. Three strains of differing maturity are to be produced; Frontier 390, very early, Frontier 400, medium early, and Frontier 410, medium, but all are equally high-yielding and drought resistant.

1813 PRIYAVRATHA RAO, S. B.
Striga on sorghum.
Mysore agric. J. 1956 : **31** : 97–100.

In a search for sorghum varieties immune to *Striga* no complete immunity has been found, but two introduced types, Bonganhilo–AS4003 and Bilichigan–AS4963, proved to be highly resistant. These varieties are being crossed with local varieties in Madras State, with the object of transferring the resistant character without transferring undesirable ear and grain characters. A number of segregates have been isolated combining a high degree of resistance with good grain colour and other desirable characters.

1814 CARTIER, J. J. & PAINTER, R. H.
Differential reactions of two biotypes of the corn leaf aphid to resistant and susceptible varieties, hybrids and selections of sorghums.
J. econ. Ent. 1956 : **49** : 498–508.

CARTIER, J. J.
The biology of the corn leaf aphid *Rhopalosiphum maidis* (Fitch), as affected by resistant and susceptible varieties, hybrids and selections of sorghums, *Sorghum vulgare* Pers.
Diss. Abstr. 1956 : **16** : Publ. No. 15,907 : p. 432.

In investigations at Kansas State College, two biotypes of corn leaf aphid, KS–1 and KS–2, were distinguished. KS–2 had the greater capacity to survive on resistant sorghums and under comparable conditions produced heavier adults than KS–1. The methods used to measure preference and antibiosis in large groups of plants and in individuals are described. Observations on 50 variety hybrids and selections showed that preference remained selectively constant under varying intensities of infestation. Nonpreference in relation to KS–1 and KS–2 was transmitted as a dominant character in the cross White Martin (preferred) x Piper 428–1 (nonpreferred). Nonpreference in the F_2 genotypes and standard varieties appeared to be related to antibiosis physiologically or genetically, or in both ways. The antibiosis of Piper 428–1, expressed as reduction of fecundity or as reduction in weight of the adults, behaved as a dominant or partially dominant character, according to the aphid biotype. It is suggested that six factors are involved in preference and antiobiosis, as distinct from tolerance: lack of attraction for the winged aphids which are repelled from a distance or after probing; lack or inhibition of stimulus for hatching of the nymphs; reduction in number of nymphs produced; lack or inhibition of stimulus to feed; reduction in weight of adults produced; and total or partial inhibition of wing formation in the progenies of apterous females. Data on F_2 and F_3 segregation suggested that preference and antibiosis are conditioned by multiple factors.

RICE

1815 Ghose, R. L. M.
Rice experiment stations in India.
News Lett. FAO Internat. Rice Comm. 1956 : No. 19 : 1–8.

The current work at the 69 rice experiment stations in India is described.

1816 Narasingarao, M. B. V.
Rice research in the Andhra State.
Andhra agric. J. 1956 : **3** : 180–86.

The aims of the rice-breeding programme in Andhra state are discussed and a list is given of improved strains of rice suitable for various regions within the state.

1817 Venkatanadhachari, G. & Narasinga Rao, M. B. V.
Studies on drought resistant short duration rice varieties, in the second crop season at the deep water rice station, Pulla.
Andhra agric. J. 1956 : **3** : 220–23.

Breeding has been in progress since 1950 to develop high yielding, drought-resistant varieties which mature sufficiently rapidly to be used in the second crop season. Yield data covering a five-year period are provided. Two lines, 5059 (CO18 x GEB24) and NX 60 (Kasipichodi x Nallarulu), now released as SLO–19, have given consistently high yields and have matured 10–15 days earlier than Nallarulu. Descriptions are given of these two lines.

1818 Alim, A. & Sen, J. L.
Linkage of characters as observed on a boro (spring paddy) cross.
Agriculture, Pakistan 1956 : **7** : 20–23.

Studies of the progeny of the cross between B70–107–17, with purple apiculus, awn and glumes, and an awnless variety, As24–1, with green apiculus and white glumes, indicate that inheritance of colour in each case is monogenic and that the three genes are closely linked.

1819 Oka, H.-I. & Kao, C.-H.
Variation in nucleolar number among varieties for cultivated rice.
Cytologia, Tokyo 1956 : **21** : 44–49.

Among about 100 Asian varieties belonging to the Continental (1), Tropical Insular (2) and Temperate Insular (3) groups, the mean number of newly formed nucleoli visible at somatic telophase was two in some varieties (binucleolar type), and varied between two and four in others (quadrinucleolar type). About two thirds of group (1) and half of group (2) were of the quadrinucleolar type while nearly all of group (3) were binucleolar. Among Japanese varieties, all lowland varieties were binucleolar and the remainder varied in type. It is suggested that rice may possess two nucleolus-organizing chromosomes, one of which is active in all varieties and the other of which varies in activity according to genotype.

1820 Hieke, K.
Poznámky ke klíčení rýže. (**Observations on germination of rice**).
Biológia, Bratislava 1956 : **11** : 257–71.

The mode of germination and emergence of the shoots and root systems of a series of varieties grown in Czechoslovakia is described and the effects of agricultural methods and external conditions upon growth and development are discussed.

1821 Mizushima, U.
(**Genetical analysis of rice**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1947 : **60** : 100–03. [Japanese].

Cf. *PBA*, XXII, Absts. 417 and 1187.

1822 Tinarelli, A.
Indagine biometrica sulle cariossidi della razza "Rinaldo Bersani". (**Biometrical study on the caryopses of the variety Rinaldo Bersani**).
Sementi elette 1956 : **2** : No. 8 : 28–36.

Slight differences in mean length of grain observed in three lots of the same pure line of the variety grown in different places are ascribed to the influence of environment. Somewhat greater differences were established between different lots of the variety reproduced for seed and greater still in lots of seed grown on farms.

1823 Baba, I., Takahashi, Y., Iwata, I. & Tajima, K.
(**Nutritional and physiological studies on red rot of rice. III. The relation between the nitrogen metabolism, carbohydrate metabolism and inorganic nutrition of rice varieties and the incidence of red rot**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **25** : 13–14. [Japanese].

The above disease is associated with potassium-deficient soils. Pot experiments with such soils showed that varietal differences in susceptibility exist. Resistance is positively correlated with content of respiratory carbohydrate.

1824 RAJAGOPALAN, K.
Variability in size and frequency of stomata in leaves of rice varieties and its correlation in drought resistance.
Madras agric. J. 1956 : **43** : 429–43.

Drought resistance was not found to be related to the size or number of stomata, in spite of varietal differences in these respects. Data from the cross between the lowland rice Co.13 and wild rice T129 suggested that size of the stomata, as indicated by the length, is a genetic feature. The hybrid progeny had significantly longer stomata than both parents.

1825 RAMACHANDRA RAO, S. & HANUMANTHA RAO, C.
A preliminary review of the performance of a new blast resistant Molakolukulu culture.
Andhra agric. J. 1956 : **3** : 234–38.

The performance is discussed of five rice progenies selected from BCP1 x Co4 for their resistance to *Piricularia oryzae*. Yield data for three years and a description of each line are given and compared with BCP1 as control. Culture 5390 gave higher yields than BCP1 and showed superior blast resistance.

1826 NARASINGA RAO, M. B. V., VENKATASWAMY, T. & SRINIVASULU, K.
Promising blast resistant culture M.42 for late planted conditions.
Andhra agric. J. 1956 : **3** : 204–08.

A selection from Molakolukulu known as M42 has been found to be tolerant of *Piricularia oryzae*, especially in later plantings. Tables are provided giving the performance of this line compared with BCP1 and BCP2, and also the morphological characters of these three lines.

1827 PADMANABHAN, S. Y.
Rice diseases in India.
News Lett. FAO Internat. Rice Comm. 1956 : No. 19 : 9–15.

Fourteen varieties have been selected from nearly 500 tested at the Central Rice Research Institute for their resistance to *Piricularia oryzae* and of these five early-maturing varieties are now in their third year of field trials at localities throughout India. In Madras state, 14 resistant varieties have been produced from crosses involving Co.4 as the resistant parent and three of these, Co.25, Co.26 and Adt. 25, have been released for general cultivation and a fourth, 6538, will be released shortly. It has been shown that there is a correlation between the degree of resistance to *P. oryzae* and the extent of silicification of epidermal cells and the number of stomata per unit area of leaf. Resistant varieties absorb silica more rapidly and have fewer stomata per unit area of leaf than susceptible varieties.

Six varieties, Ch.13, Ch.45, T141, T498–2A, Bam.10 and Co.20, have proved resistant to *Helminthosporium oryzae*, although T498–2A is not resistant in all localities.

In Bengal, Dudsar 4 is resistant to *Sclerotium oryzae* under severe natural infection and Basmati 370, Basmati 3, Mushkan 7, Mushkan 4 and Bara 62 are highly resistant in the Punjab. PTB10, N136, Benibhog, ADT4 and ADT15 are relatively resistant to root rot, which is thought to be due to water-logging and perhaps also to lack of phosphorus.

1828 TIRUMALARAO, V., PERRAJU, A., RANGARAO, P. V., NARAYANA, K. L. & RAMAKRISHNA RAJU, K.
The rice stem borer (*Schoenobius incertellus* Wlk.) problem in Andhra State.
Andhra agric. J. 1956 : **3** : 209–19.

No variety has been found to possess complete immunity to *Schoenobius incertellus* but GEB24 shows only a low incidence of attack.

1829 DUBROVINA, V. A.
(The results of investigating the light-phase in some rice varieties).
Agrobiologia (Agrobiology) 1956 : No. 3 : 31–34. [Russian].

Photoperiodic requirements of several varieties were studied at Odessa. Malovodotrebovateljnyĭ 2741 [Moderate in Water Requirement 2741] required the shortest photoperiod; it developed normally in a six-hour day.

FORAGE GRASSES

Cuarta Reunión de Plantas Forrajeras realizada en la Estación Experimental de Anguil (La Pampa), 20–22 de julio de 1954. [**Fourth Meeting on Forage Plants held at the Anguil (La Pampa) Experimental Station, 20-22 July 1954**]. Pp. 230.

The full report of this conference contains the following contributions in addition to the items referred to in *PBA*, XXV, Absts. 2037–47.

1830 *Tessi, J. L. Variedades de sorgo resistentes a la bacteriosis producida por* Pseudomonas andropogoni. *(Sorghum varieties resistant to bacterial rot caused by* Ps. andropogoni). *(p. 29).*

Varieties found to be sufficiently resistant for practical purposes included selections of Cody and Ellis and a hybrid of Leoti x Atlas.

1831 *Briggiler, H. Resultados obtenidos en el ensayo comparativo regional con selecciones de sorgo azucarado. (Results obtained in a comparative regional test with selections of sweet sorghum). (pp. 40–42).*

Trials of a number of selections showed S243–1–3–11–0 to be the most resistant to drought; all selections exceeded the common strain in yield of green fodder, the best being S243–1–1–13–0, S243–1–1–12–0 and S243–1–3–11–0.

1832 *Marcó, A. M. Ensayo de orientación sobre producción de grano con variedades de sorgos graníferos y maíz. (Preliminary test on grain yield with varieties of grain sorghum and maize). (pp. 65–67).*

All the sorghum varieties outyielded the standard maize under conditions of deficient rainfall, the best yield being given by Feterita Sel. Pergamino, with 34,865 kg. of green fodder and 365 kg. of grain per ha.

1833 *Serrano, H. Comportamiento de nuevas selecciones de falaris perennes en la Región Pampeana. (Behaviour of new selections of perennial* Phalaris *spp. in the region of La Pampa). (pp. 110–13).*

The new selections of *Ph. tuberosa* produced at the Pergamino research station have proved their superiority, Sel. Perg. PF 174–1 being specially promising; it has given a yield of 11,848 kg. of green fodder per ha., which is 71·8% above that of the common strain. Selections of *Ph. arundinacea* on the other hand were disappointing.

1834 *Ballari, C. P. Comportamiento de poblaciones y selecciones de mijo* (Panicum miliaceum) *y moha de Hungría* (Setaria itálica) *en la región semiárida. (Behaviour of populations and selections of* P. mileaceum *and* S. italica *in the semiarid region). (pp. 166–70).*

Mass selection carried out in populations obtained from a number of different localities has led to the production of improved strains, the best selections of *P. mileaceum* being Alto de Guatraché [Guatraché Tall], Mf. 451 and Pico 270, with average fodder yields of from 1600 to 1700 kg. per ha. In *S. italica* the best were Maracó 266 and Metileo 260, with almost 1100 kg. per ha. Selections Mf. 451, Metileo 260 and Maracó 266 were distinguished by high tillering capacity and certain others are mentioned for their earliness.

1835 *Triveño Pinto, R. Comportamiento de nuevas selecciones y variedades de avena en la región Pampeana. (Behaviour of new selections and varieties of oats in the region of La Pampa). (pp. 184–87).*

Several selections from the Guatraché experimental station were outstanding in yield of fodder and of grain.

1836 *Triveño Pinto, R. Comportamiento de nuevas selecciones y variedades de centeno en la región Pampeana. (Behaviour of new selections and varieties of rye in the region of La Pampa). (pp. 192–96).*

Selections MF73 and MF79 from Manfredi and mass selection 2 of the Instituto de Fitotecnia [Plant Breeding Institute] gave the highest yields of fodder.

1837 *Ballari, C. P. Rendimiento en grano de variedades de avena, cebada forrajera y centeno en Pico. (Grain yield of varieties of oats, forage barley and rye at Pico). (pp. 198–99).*

Special mention is made of the new variety Guatraché Araucana MAG and selection FAV19 among the forage barleys.

European Grassland Conference, Paris 21-24 June 1954.
OEEC : Pp. 393. (Mimeographed).

1838 *Cauderon, Y. Cross-breeding* (Triticum *x* Agropyrum). *(pp. 61–63).*

Some of the results obtained at the Central Plant Breeding Station, Versailles, in crosses between species of *Triticum* and *Agropyron* are described. Crosses involving *A. glaucum, A. campestre* and *A. elongatum* have proved particularly interesting, although the F_1 plants are usually sterile. Some fertile amphidiploids have been obtained by colchicine treatment of F_1 plants from two crosses, namely *T. dicoccum* x *A. glaucum* and *T. timopheevi* x *A. glaucum* (cf. *PBA*, XXV, Abst. 2609). In the crosses *T. timopheevi* x *A. campestre, T. persicum* x *A. glaucum, T. vulgare* x *A. glaucum* and *T. vulgare* x *A. elongatum* colchicine treatment was unsuccessful but fertile plants were obtained by back crossing to the *Triticum* parent. Sterility was due to aneuploidy, meiotic irregularities and failure of pollen formation and anther dehiscence. The crosses *T. vulgare* x *A. glaucum* and *T. vulgare* 'Progress' x *A. elongatum* and its reciprocal are discussed in some detail.

1839 *Wexelsen, H. & Vestad, R. Observations on pollination and seed setting in diploid and tetraploid red clover. (pp. 64–68).*

The following differences have been observed between diploid and tetraploid strains of red clover: diploid plants have on the whole shorter corolla tubes and are preferred by honey bees; diploid plants produce more seeds per head than tetraploids in the field but when self pollinated tetraploids gave more seed than diploids. Large variations were found among the tetraploids in the amount of seed set and methods of selection for seed setting are described.

1840 *Julén, G. Aspects on the breeding of tetraploid red clover with special reference to the seed setting problem.* (*pp. 69–72*).

Some of the problems encountered in breeding tetraploid red clover are described. Poor seed setting in tetraploids is associated with aneuploidy, which results in the abortion of developing embryos and irregularities at meiosis, including the formation of univalents, quadrivalents, laggards and fragments.

1841 *Gelin, O. Swedish experiences with polyploid clover strains.* (*pp. 73–74*).

From the results of comparative trials of diploid and tetraploid Alsike and red clover strains at several localities in Sweden and Finland it is concluded that tetraploid strains are particularly promising in respect of improved yield and adaptability.

1842 *Wit, F. & Speckmann, G. J. Breeding of tetraploid ryegrasses.* (*pp. 75–79*).

After reviewing the literature concerning induced polyploidy in species of *Lolium* the authors describe their own work in the Netherlands with *L. perenne* and *L. multiflorum*, giving comparative figures, for diploids and colchicine-induced tetraploids, of vigour, rust resistance and winter hardiness. In the case of *L. perenne* the majority of tetraploids were inferior to the diploids, although in respect of winter hardiness a few equalled the diploids; some of the tetraploids of *L. multiflorum*, however, were superior to the diploids in respect of tillering, productivity, regrowth, rust resistance or winter hardiness.

1843 *Beddows, A. R. Strain building in cross-fertile grasses: the selection and evaluation of parent plants, systems of breeding and the assessment of potential strains.* (*pp. 79–84*).

The criteria used at the Welsh Plant Breeding Station, Aberystwyth, in selecting plants to be used as parents in a forage-grass strain-building programme are described and discussed. Comments are also made on some breeding techniques, for example the use of male-sterile plants, inbreeding and polycross techniques and on the evaluation of progeny.

1844 *Picard, J. Observations on methods of assessing the value of plants or stocks to be used in the formation of strains.* (*pp. 84–88*).

It is suggested that knowledge of the general combining ability, obtained from top crosses, polycrosses or diallel crosses is of greater value in the breeding of forage plants than information regarding specific combining ability.

1845 *Demarly, Y. Use of inbreeding in breeding fodder plants.* (*pp. 88–93*).

The possibility and desirability of the use of inbreeding in the development of forage crops are discussed and the relevant literature is reviewed. It is concluded that the development of inbred strains is not practicable, firstly since many forage grasses and legumes are largely self sterile and secondly since increasing homozygosity is accompanied by a decline in vigour. Inbreeding is, however, considered of value for those stages in a breeding programme where selection for special characteristics is carried out.

1846 *Hutin, C. Shift in strains occurring in the course of their multiplication: genetic and practical problems involved.* (*pp. 98–101*).

Suggestions are made for developing artificial stability in commercial strains of forage plants to counteract the effect of shift during multiplication due to various types of natural selection, such as different seed-yielding capacity among individuals and the selective elimination of plants by cold and disease, in order to make possible the marketing of standardized products.

1847 *Rebischung, J. Palatability—its importance as a criterion for selection—experimental methods of measurement.* (*pp. 106–10*).

It is suggested that palatability should be regarded as an important criterion in the breeding of forage grasses and methods for its evaluation are discussed.

1848 *Zanini, E. Prospects of dry spring and summer cultivation of new strains of "Gentile" sorghum for fodder* (Sorghum sudanense *Staph*) *in the hot dry areas of southern Italy and the Italian islands.* (*pp. 130–37*).

Varieties of Sorghum from the USA and South America were tested at several localities in Sicily in 1950–1953 with a view to their use for forage production. Data are provided on the yields of first and second cuts and Saturno, Sweet Sudan Grass and Honey Drip are recommended.

1849 HUTTON, E. M.
Some problems in the breeding of sub-tropical pasture plants.
J. Aust. Inst. agric. Sci. 1956 : **22** :225–26.

Some aims in breeding forage legumes and grasses for subtropical pastures are briefly discussed. Various pollination mechanisms operating in legumes are described.

1850 HUNT, I. V.
Comparative productivity of 27 strains of grasses in the west of Scotland.
J. Brit. Grassl. Soc. 1956 : **11** : 207–15.

Of the 27 grasses tested (cf. *PBA*, XXVI, Abst. 3387), the four timothy strains S51, Scotia, S48 and Scandinavian produced the largest hay crops but gave relatively poor aftermath yields. New Zealand perennial ryegrass was best in terms of combined quality and hay and aftermath yield.

1851 TATEOKA, T.
Karyotaxonomy in Poaceae. III. Further studies of somatic chromosomes.
Cytologia, Tokyo 1955 : **20** : 296–306.

Somatic chromosome numbers are reported for 68 species.

1852 CELARIER, R. P.
Additional evidence for five as the basic chromosome number of the Andropogoneae.
Rhodora 1956 : **58** : 135–43.

Three types of evidence suggest that $x = 5$ is the basic chromosome number: (1) in some species, e.g. *Sorghum versicolor*, $n = 5$; (2) in some species, e.g. *Narenga porphyrocoma*, $n = 15$; and (3) the chromosome complements of some species, e.g. in *Hyparrhenia*, have a set of 5 chromosomes morphologically distinguishable from the rest.

1853 DE WET, J. M. J. & ANDERSON, L. J.
Chromosome numbers in Transvaal grasses.
Cytologia, Tokyo 1956 : **21** : 1–10.

Chromosome counts ($2n$) have been made in 79 species. On the basis of the number and morphology of the chromosomes, it is suggested that *Ehrharta* should be transferred to the tribe Oryzeae and *Tetrachne* to the Eragrosteae.

1854 OVESNOV, A. M.
(Grass seeds with two embryos).
Priroda (Nature), Leningrad 1956 : No. 11 : 111–12. [Russian].

Instances of polyembryony in *Alopecurus*, *Agrostis*, *Deschampsia*, *Dactylis* and *Poa* are reported from Molotov. Up to 8% of a sample of *P. angustifolia* from the Kama Basin had two radicles and two plumules.

1855 BOR, N. L.
Notes on Asiatic grasses: XXVI. New species.
Kew Bull. 1956 : 255–58.

Descriptions of the new species *Agrostis stewartii* and *Panicum fischeri* found in the Indian subcontinent are included.

1856 CELARIER, R. P. & HARLAN, J. R.
An Andropogoneae garden in Oklahoma.
Taxon 1956 : **5** : 183–86.

A short account is given of the general procedures used in establishing the collection of representatives of the Andropogoneae at the Oklahoma Agricultural Experiment Station. A survey of the cytotaxonomy of the tribe has been accomplished and interspecific relationships in certain genera and genetic complexes are now being analysed, particular attention being given to *Sorghum* sect. *Eu-sorghum* and the complex *Amphilophiastrae* which includes *Bothriochloa*, *Dichanthium*, *Capillipedium*, *Ermopogon* and *Euclasta* (cf. Abst. 593). The authors draw attention to deficiencies in the collection with respect to representatives from a number of geographical areas throughout the world and invite cooperation in remedying this situation and comments on their approach to the problems under consideration.

1857 ARMSTRONG, J. M.
The role of plant introductions in forage crop improvement.
Agric. Inst. Rev. 1956 : **11** : No. 6 : 31–32, 52.

After a short account of the general problems of plant introduction, this popular article discusses the origin of forage crops now adapted in Canada and outlines the current programme of forage-crop introduction in that country.

1858 MEINERS, J. P. & HOLTON, C. S.
Fusions between primary sporidia from different species of *Tilletia*.
Phytopathology 1956 : **46** : p. 638. (Abst.).

Sporidial fusions were obtained between several species of *Tilletia* in culture. The following species were intercompatible: *T. caries* from wheat, *T. fusca* from *Festuca* spp., *T. guyotiana* from *Bromus japonicus* and an unidentified species from *B. tectorum*. *T. controversa* from wheat gave sporidial fusions with *T. guyotiana*, *T. fusca*, *T. caries* from *B. marginatus* and the unidentified species from *B. tectorum* but not with *T. holci*, *T. cerebrina*, *T. asperifolia* or *T. elymi*, nor were fusions obtained between *T. cerebrina* and *T. caries*, *T. fusca*, *T. guyotiana* and the species from *B. tectorum*. Evidence was found of different degrees of compatibility as shown by the percentage of mated pairs which fused and their subsequent development.

1859 NYGREN, A.
Further studies in diploid *Poa alpina* with and without accessory chromosomes at meiosis.
Kungl. LantbrHögskolans Ann. 1956 : **22** : 179–91.

In further work on a population of diploid *P. alpina* ssp. *xerophila* from Ardez, Switzerland (cf. *PBA*, XXVI, Abst. 1340) all the plants examined had two accessory chromosomes which normally formed a bivalent at meiosis. One plant had one extra fragment. The offspring resembled the parents in meiotic configuration, with the exception of one seedling which had no accessory chromosomes and one which had 7–12 extra chromosomes. The last-mentioned plant showed highly irregular meiosis with many univalents and a low chiasma frequency per bivalent. *P. badensis* from Baden, Austria, is a diploid with some morphological resemblance to *P. alpina* ssp. *xerophila*. It had no accessories but two of the chromosomes were seen to be similar in morphology to two in *P. alpina* ssp. *xerophila*. Number of accessories appeared to have no influence upon plant vigour.

1860 NYGREN, A.
Chromosome studies in the *Poa laxa* group.
Kungl. LantbrHögskolans Ann. 1956 : **22** : 359–68.

A single triploid population ($2n = 21$) of *P. laxa* from the Swiss Alps was sterile and had a modal metaphase I configuration of $7_{II} + 7_{I}$, while three tetraploid populations of *P. laxa* and three of *P. minor*, also from the Alps, had 14_{II} and were highly fertile with normal sexual reproduction. Material of *P. fernaldiana* ($2n = 42$) from the Gaspé Peninsular, Quebec, mostly had 21_{II}, with occasional quadrivalents or univalents; this species had 62·2% good pollen, reproduced sexually and gave high seed sets.

1861 **Spaced-plant trials at East Craigs.**
Scot. Agric. 1956–57 : **36** : 160–61.

Observations on the time of maturity, growth habit and other characters of cocksfoot strains tested for four years at East Craigs, Edinburgh, Scotland, are discussed. With the exception of Scotia, the strains were classifiable as early or late. Scotia combined earliness with the habit of growth and stem length of the late group.

1862 BIERI, R.
Über einige morphologische und anatomische Merkmale des Knaulgrases (*Dactylis glomerata* L.) und ihre Beziehungen zu Futterwertseigenschaften. **[On some morphological and anatomical characters of cocksfoot (*D. glomerata* L.) and their relationships to fodder properties].**
Juris-Verlag, Zürich 1956 : Pp. 74.

This doctorial thesis is concerned primarily with a study of morphological and anatomical differences in *D. glomerata* as an aid in selecting for improved fodder value, in particular higher protein content. Wild material was collected from a number of localities in north-east Switzerland and the crude protein and fibre contents of the leaves and stems were evaluated. A positive correlation of 0·26 was established between chlorophyll content and protein content and it was found possible to select for high protein content on the basis of leaf colour. Plants with thick stems had a lower protein content and a higher fibre content than those with fine stems, early-maturing strains had a higher protein content than late-maturing strains. Forms with a high leaf : stem ratio had a higher percentage of protein than those with a low leaf : stem ratio. Microscopical studies of cross sections of the leaf and stem were not reliable as a means of assessing protein or fibre content although an association was observed in many cases between the thickness of the sclerenchyma wall and fibre content. Differences were noted between strains in the frequency of stem hairs, a character which appeared to be related to silicic acid content.

1863 JONES, K.
Species differentiation in *Agrostis*. I. Cytological relationships in *Agrostis canina* L.
J. Genet. 1956 : **54** : 370–76.

In investigations at the Welsh Plant Breeding Station, Aberystwyth, regular bivalent formation, with a mean frequency of 1·35 half chiasmata per chromosome, was observed in the diploid *A. canina* ssp. *canina* ($2n = 14$). *A. canina* ssp. *montana* ($2n = 28$) behaved as an autopolyploid, with mean configurations of $0{\cdot}16_{I}$, $8{\cdot}48_{II}$, $0{\cdot}06_{III}$ and $2{\cdot}66_{IV}$, and a mean frequency of 1·67 half chiasmata per chromosome. The occurrence of an association of 8 chromosomes in one plant indicated that ssp. *montana* is structurally heterozygous for interchanges. Study of the triploid hybrid between the two subspecies confirmed the autotetraploid and structurally heterozygous nature of ssp. *montana* and indicated that the chromosomes of the two parents are highly homologous. Ssp. *montana* may be an autopolyploid in the strict sense but its rhizomatous habit, in contrast to the non-rhizomatous nature of ssp. *canina*, renders this interpretation difficult of acceptance. Possibly ssp. *montana* arose through hybridization between distinct ecotypes of ssp. *canina*.

1864 Jones, K.

Species differentiation in *Agrostis*. II. The significance of chromosome pairing in the tetraploid hybrids of *Agrostis canina* subsp. *montana* Hartm., *A. tenuis* Sibth. and *A. stolonifera* L.

J. Genet. 1956 : **54** : 377–93.

A. tenuis ($2n = 28$) and the tetraploid form of *A. stolonifera* ($2n = 28$) formed only bivalents, with a mean frequency of 1·45 and 1·76 half chiasmata per chromosome respectively. The degree of pairing in the sterile F_1 of *A. stolonifera* x *A. canina* spp. *montana* was low and variable, the mean metaphase pairing being $15{\cdot}75_{\mathrm{I}}$, $4{\cdot}81_{\mathrm{II}}$, $0{\cdot}78_{\mathrm{III}}$ and $0{\cdot}03_{\mathrm{IV}}$ per cell and the maximum pairing 7_{I}, 1_{II}, 5_{III} and 1_{IV}. Pairing was practically complete in the F_1, F_2 and back-cross generations of the cross between *A. tenuis* and ssp. *montana*. In the F_1, the mean metaphase pairings were $0{\cdot}16_{\mathrm{I}}$, $8{\cdot}66_{\mathrm{II}}$, $0{\cdot}06_{\mathrm{III}}$ and $2{\cdot}56_{\mathrm{IV}}$. Pollen fertility was high in all generations. The fifteen highly sterile hybrids of *A. stolonifera* x *A. tenuis* showed considerable variation between plants in pairing, the mean number of univalents ranging from 3·54 to 13·40 per plant. Within plants, a negative correlation ($r = -0{\cdot}872$) was detected between the mean frequency of chiasmata per bivalent and number of bivalents per cell. The disparities among the individual hybrids are attributed to the production of variable gametes in *A. tenuis* as the result of intergenomic pairing. It is suggested that *A. tenuis* is a segmental allopolyploid into whose origin the diploid ancestor of *A. canina* ssp. *montana* entered. Although ssp. *montana* possesses some of the features of an autotetraploid, it may have evolved as the result of introgression of a nonrhizomatous autotetraploid of *A. canina* with a rhizomatous *A. tenuis* type. *A. stolonifera*, an allotetraploid with well-differentiated genomes, probably has one ancestral diploid in common with *A. tenuis*.

1865 Jones, K.

Species differentiation in *Agrostis*. III. *Agrostis gigantea* Roth. and its hybrids with *A. tenuis* Sibth. and *A. stolonifera* L.

J. Genet. 1956 : **54** : 394–99.

A. gigantea ($2n = 42$) showed regular bivalent formation at meiosis, with a mean of 1·97 chiasmata per bivalent. In the pentaploids ($2n = 45$) obtained from *A. tenuis* x *A. gigantea* and *A. stolonifera* x *A. gigantea*, 14_{II} and 7_{I} were usually formed, the mean number of chiasmata per bivalent ranging from 1·88 to 2·07 per plant. On the basis of number of seeds set per panicle in open pollination, the F_1 plants of *A. tenuis* x *A. gigantea* were as fertile as the parents but it is emphasized that fertility is not an indication of fitness of the seeds to their natural environment since the seeds of the hybrids are largely aneuploid. Three of the F_2 plants of *A. tenuis* x *A. gigantea* obtained by intercrossing F_1 plants were studied meiotically. Their chromosome numbers were $2n = 32$, $33 + 1$ B chromosome, and 33 respectively; fourteen bivalents were invariably present at metaphase I. One back-cross plant ($2n = 32$) of *A. tenuis* x *A. gigantea* formed 14_{II} and 4_{I} in most cells; in another back-cross plant ($2n = 32$), pairing was poor, with a mean of $15{\cdot}04_{\mathrm{I}}$. The following genome formulae are proposed: *A. tenuis*, $A_1A_1A_2A_2$; *A. stolonifera*, $A_2A_2A_3A_3$; and *A. gigantea*, $A_1A_1A_2A_2A_3A_3$. Although *A. gigantea* hybridizes with the two $4n$ species under natural conditions, no evidence of gene flow has been obtained.

1866 Bosemark, N. O.

Cytogenetics of accessory chromosomes in *Phleum phleoides*.

Hereditas, Lund 1956 : **42** : 443–66.

Of the 1402 plants of *Ph. phleoides* ($2n = 14$) collected in Sweden, 31·1% had one or more accessory chromosomes. Plants from different areas showed marked disparities in frequency of accessories but, since the distribution of the species is discontinuous, these differences may be mainly due to phytohistorical factors or random distribution. Evidence of the influence of ecological factors upon the distribution of accessories on the island of Öland suggested, however, that such factors may also be of general importance. The majority of the accessories of the standard type had a sub-terminal centromere and were about two-fifths of the average length of the normal chromosomes. In a few plants, accessories larger or smaller than the standard type from which they derived were observed; these were isochromosomes or, in the case of some of the smaller derivatives, the result of terminal deficiencies. The number of accessories in the root tips of a single plant was constant and corresponded to that in the pollen mother cells. The meiotic behaviour of the accessories was on the whole similar to that in other grass species (cf. *PBA*, XXVI, Abst. 22). Directed nondisjunction of the accessories at the first pollen mitosis was of the same type as in rye, *Anthoxanthum* and *Festuca*. Investigation of the inheritance of accessories confirmed the observations on meiosis and nondisjunction, since they indicated a high degree of efficiency in the transmission and multiplication of the accessories.

1867 Dolan, D. D.
Better bromegrasses for the North-east ?
Fm. Res. 1956 : **22** : No. 4 : p. 4.

The characteristics are described of a number of strains of *Bromus* spp., mainly from Iran, introduced with a view to their possible use in the improvement of hay crops in the north-eastern part of the USA.

1868 Emery, D. A. & Dunn, G. M.
Selection in smooth bromegrass for resistance to *Pyrenophora bromi* (Died.) Drechsl.
Agron. J. 1956 : **48** : 398–401.

In greenhouse studies of the reaction of *Bromus inermis* to inoculation with *P. bromi*, the correlation between seedling and adult reaction in 17 clones was highly significant ($r = +0{\cdot}61$). The correlation between clones from the same plant was also highly significant ($r = +0{\cdot}46$) and the correlations between parents and their open-pollinated progeny were significant and varied between $r = +0{\cdot}26$ and $r = +0{\cdot}65$. Under conditions of natural infection in the field, differences between strains and varieties were significant and tended to be maintained in successive years but many field-resistant selections were found to be susceptible upon inoculation. A simple procedure for screening polycross breeding material by inoculation in the field before progeny testing is carried out is outlined.

1869 Reusch, J. D. H.
Influence of gamma irradiation on the breeding affinities of *Lolium perenne* and *Festuca pratensis*.
Nature, Lond. 1956 : **178** : 929–30.

Reusch, J. D. H.
Effect of gamma irradiation on the affinities of *Lolium perenne* and *Festuca pratensis*.
Heredity 1956 : **10** : p. 127. (Abst.).

Untreated crosses between *L. perenne* and *F. pratensis*, made at the University College of Wales, Aberystwyth, fell into four groups with respect to seed compatibility, ranging from combinations in which none of the seeds were viable to those in which as many as 50% of the caryopses germinated. In general, seed set was reduced below that in the controls as the result of irradiating inflorescences of the parent species about 7 days before anthesis with 250–500 r. With doses of 1000–2000 r., seed set increased, but further increases in dose resulted in another decline. The effect of γ irradiation on seed compatibility, although in general similar to that observed for seed set, showed greater variability. Genotypic differences in response to irradiation were expressed. At doses of 1000–2000 r. selective elimination of the more severely damaged pollen grains may have occurred, whereas at lower doses the less severely affected grains entered into fertilization, seed set being reduced through subsequent degeneration of the ovules. It is further suggested that irradiation is capable of inducing changes which improve endosperm development.

1870 Green, J. O.
Perennial ryegrasses today and tomorrow.
Agric. Rev., London 1956 : **2** : 10–14.

The value of strains of perennial ryegrass in the United Kingdom is discussed, reference being made to the results of trials carried out by the Grassland Research Institute, Hurley, Berkshire.

1871 Stebbins, G. L.
Taxonomy and the evolution of genera, with special reference to the family Gramineae.
Evolution, NY 1956 : **10** : 235–45.

"The morphological characteristics are reviewed of two groups of grasses in which a large number of supposed intergeneric hybrids have been obtained, namely the genera *Festuca* and *Lolium*, and the tribe Hordeae. This study leads to the conclusion that the supposed genera can be recognized only on the basis of certain conspicuous characteristics of the inflorescence, and if all of the morphological differences are considered together, or if emphasis is placed upon the perianth (lodicules) and mature fruit or caryopsis, the species concerned differ from each other no more than do different species belonging to the same genus elsewhere in the family. In other genera (*Glyceria* and *Lepturus*) morphological and cytological evidence indicates that these should be split. This type of evidence leads to the conclusion that the differentiation of genera comes about by means of processes

which are a continuation of those operating in the origin of species, but with greater emphasis on the extinction of intermediate populations."
[Author's summary].

1872 **Pennlawn red fescue.**
What's New Crops Soils 1956 : **9** : No. 2 : p. 23.

A new variety of creeping red fescue for turf has been developed at the Pennsylvania Agricultural Experiment Station. It is tolerant of shade, disease, high temperatures and high humidity and has been named Pennlawn. Its origin is not given.

1873 RODER, W.
Untersuchungen über die Entwicklung der Wurzel- und Grünmassebildung bei Schafschwingel, *Festuca ovina* L., unter Berücksichtigung züchterischer Aspekte. (**Studies on the development of root and green-matter formation in sheep's fescue, *F. ovina* L., with reference to breeding aspects**).
Z. Pflanzenz. 1956 : **36** : 153–64.

In all the lines and provenance types tested a positive correlation was established between root growth and amount of green matter produced. Selection of plants for luxuriant growth is thus an efficacious method of selecting for good root-growth and consequently for drought resistance. Selection for good root-growth in the juvenile stage was not, however, reliable and experiments indicated that plants should be at least one year old before selection, on the basis of leaf weight, is carried out.

1874 HAYMAN, D. L.
The genetical control of incompatibility in *Phalaris coerulescens* Desf.
Aust. J. biol. Sci. 1956 : **9** : 321–31.

It has been found that the complete self incompatibility of *Phalaris coerulescens* is controlled by two independently segregating loci, each with a series of multiple alleles. The genes act independently in determining the compatibility behaviour of the style. A pollen grain is incompatible on a style when the two genes it carries are both present in that style; in these circumstances pollen-tube growth stops soon after germination of the pollen grain has taken place. This incompatibility system is discussed with reference to previously described systems.

1875 GOULD, F. W.
***Andropogon saccharoides* Swartz var. *longipaniculatus* var. nov.**
Field & Lab. 1955 : **23** : 17–19.

American samples of *A. saccharoides* can be subdivided into two taxa: (1) the specific type with small panicles and $2n = 60$ chromosomes; and (2) var. *longipaniculatus* with large panicles and $2n = 120$ chromosomes.

1876 SWAMINATHAN, M. S. & JOGINDER NATH
Two new basic chromosome numbers in the genus *Pennisetum*.
Nature, Lond. 1956 : **178** : 1241–42.

The chromosome numbers of $2n = 10$ and $2n = 32$ are reported for *P. ramosum* and *P. massaicum* respectively. The former species showed regular formation of bivalents; in the latter the mean configuration was $0{\cdot}85_{IV} + 0{\cdot}125_{III} + 13{\cdot}625_{II} + 0{\cdot}975_{I}$. Seed setting was high in *P. ramosum* but low in *P. massaicum*, which may be a segmental allotetraploid. It is suggested that the original basic number of the genus was $x = 5$, from which the numbers of $x = 7$, 8 and 9 were derived.

1877 SHETH, A. A., YU, L. & EDWARDSON, J.
Sterility in pangolagrass (*Digitaria decumbens* Stent).
Agron. J. 1956 : **48** : 505–07.

Vegetative material of the above species was introduced into the USA in 1935 and has proved to be highly sterile. Cytological examination showed that microsporogenesis was irregular, with lagging chromosomes giving unbalanced daughter nuclei, and that meiosis in megaspore mother cells never progressed beyond leptotene. The modal number of chromosomal bodies observed at diakinesis in pollen mother cells was 17, while root-tip cells had $2n = 30$; clonal material from a single seedling obtained in 1953 had $2n = 27$.

1878 BJÖRKMAN, S. O.
***Zingeria biebersteiniana* (Claus) P. Smirn.—one more grass species with the chromosome number 2n = 8.**
Svensk bot. Tidskr. 1956 : **50** : 513–15.

The chromosome number $2n = 8$ has been found in Rumanian material of *Z. biebersteiniana*, a species previously assigned to the genus *Agrostis* section *Anagrostis*, which has $x = 7$. The species is being transferred together with other *Agrostis* species resembling it in certain spikelet characters and chromosome number to a new genus, *Keniochloa*.

1879 WARNOCK, B. H.
***Bouteloua kayi*, a new grama grass from Trans-Pecos Texas.**
Field & Lab. 1955 : **23** : 15–16.

A diagnosis and figure of the above species is given. It was found in southern Brewster Co., Texas.

1880 Nielson, A. K.
A study of the variability of *Distichlis stricta* selections from several geographical locations in the western United States.
Abstracts of Theses. Monogr. Ser. Utah St. agric. Coll. 1956 : **4** : No. 4 : p. 24.

Selections of *D. stricta* ($2n = 40$) showed marked differences in flower production, plant colour, leaf dimensions, stolon production and rhizomatous growth, but plants within selections were extremely uniform. A 1 : 1 ratio was found for the numbers of ♀ and ♂ plants in this diecious species; a few monecious plants were observed. Breeding to improve forage quality in *D. stricta*, a species valuable for its "salt and water tolerance", is recommended.

1881 Hodgson, H. J.
A new *Elymus* from Alaska.
Rhodora 1956 : **58** : 144–48.

A new species, *E. pendulosa*, with pendent spikes is described. It has $2n = 28$ chromosomes.

1882 **Woodward sand bluestem.**
What's New Crops Soils 1956 : **9** : No. 3 : p. 21.

A variety of *Agropyron arenicola* has been selected from a collection of native plants at Woodward, Oklahoma, and will be released under the name Woodward. It is leafier, has finer stems and produces more seed than unselected material and is recommended for permanent grass seeding on sandy soil in Oklahoma and southern Kansas.

1883 Cauderon, Y.
Étude comparative du comportement en méiose de quelques *Agropyrum* et de leurs hybrides F_1. (**Comparative study of the behaviour during meiosis of some species of *Agropyron* and their F_1 hybrids**).
CR Acad. Sci., Paris 1956 : **243** : 1054–56.

Crosses were effected between *A. campestre* ($2n = 56$) on the one hand and *A. repens*, *A. glaucum* and *A. junceum*, all of which have $2n = 42$, on the other. The progenies of these crosses were all sterile and had a chromosome complement of $2n = 49$, with the exception of a single plant from *A. campestre* x *A. glaucum* with $2n = 48$. Meiosis in the pollen mother cells of the parent species was fairly regular, but a cytological study of meiosis in the hybrids revealed a number of anomalies, including numerous univalents and micronuclei, inversion bridges and lagging. The four species studied appear to possess at least one genome in common.

1884 Witte, P.
A cytotaxonomic study of suspected hybrids between *Agropyron subsecundum* and *Sitanion hystrix*.
Abstracts of Theses. Monogr. Ser. Utah St. agric. Coll. 1956 : **4** : No. 4 : p. 30.

The morphological characteristics of the hybrids were intermediate between those of *Agropyron* and *Sitanion*. The proximity of the hybrids to *A. subsecundum* and *S. hystrix* in the field supported the view that they were F_1 hybrids between these species. Bivalent pairing at metaphase I was fairly high. The sterility of the hybrids may be due to chromosome loss and fragmentation, as well as to cryptic structural hybridity.

1885 Hair, J. B.
Subsexual reproduction in *Agropyron*.
Heredity 1956 : **10** : 129–60.

Reproduction was studied in individual plants and their progenies from each of four morphologically distinct populations, A, B, C and D, of the self-pollinating species *A. scabrum* in New Zealand. All were entirely or predominantly hexaploid ($2n = 42$). Plants of population A were completely and normally sexual in behaviour. Those of B were facultatively apomictic, giving normal, n, $3n$ and aneuploid plants among the progenies, which were highly variable in fertility and morphology. Plants of C were predominantly apomictic, meiosis being suppressed in the embryo-sac mother cell. Individuals of population D were obligatorily apomictic, with suppression of meiosis in both male and female mother cells. In the apomictic populations embryo sacs arose either by mitotic division or by meiosis followed by restitution, the latter type being termed subsexual. Embryo development was abortive unless endosperm development resulting from the fertilization of the fusion nucleus by a male generative nucleus occurred. In B and C reduced pollen was mainly effective, and in D unreduced.

The four types of reproduction are considered to represent stages in the evolution of apomixis. Subsexual recombination provides for variation in the genotypic control of the reproductive mechanism and hence for adaptive evolution of the genetic system.

LEGUMINOUS FORAGE PLANTS

1886 Turner, B. L.
Chromosome numbers in the Leguminosae. I.
Amer. J. Bot. 1956 : **43** : 577–81.

Haploid chromosome numbers of 39 taxa are reported, including 34 whose numbers have been determined for the first time. Among the species investigated are the following: *Bauhinia congesta*, 14; *Cassia fasciculata* var. *ferrisiae*, 8; *Cassia durangensis*, *C. occidentalis*, *C. roemeriana* 14; *Crotalaria pumila*, 16; *Astragalus leptocarpus*, 13; *Indigofera hendecaphylla*, *I. lindheimeriana*, 8; *I. leptosepala*, *I. texana*, 16; *Amorpha fruticosa* var. *angustifolia*, 20; *Psoralea cyphocalyx*, *Ps. digitata* var. *parvifolia*, *Ps. hypogaea*, *Ps. rhombifolia*, *Desmodium rotundifolium*, *D. sessilifolium*, *Phaseolus metcalfei*, *Ph. semierectus*, 11; and *Lathyrus pusillus*, *Vicia leavenworthii* and *V. ludoviciana*, 7.

1887 WILLEY, L. A.
Lucerne strain trials.
J. nat. Inst. agric. Bot. 1956 : **7** : 597–623.

This report includes the results of field trials sown between the years 1948 and 1951 together with a brief account of prewar trials not previously reported, including a total of 17 strains. Data are provided on total yields and first, second and third cuts as percentages of those of Provence and the performance of the strains is discussed.

1888 **Alfalfa crown branches vary.**
What's New Crops Soils 1956 : **9** : No. 3 : p. 20.

Differences have been recorded at the University of Wisconsin between lucerne varieties in respect of the underground growth of crown branches, the greatest number being produced by Rhizoma and Alaska falcata, although the spread of the crown in the latter variety was not so great as that of some others.

1889 ZALESKI, A.
Lucerne investigation. II. Pollination and seed setting in lucerne strains.
J. agric. Sci. 1956 : **48** : 236–44.

A short report of this work was summarized in *PBA*, XXVI, Abst. 2460.

1890 OLDEMEYER, R. K.
Inheritance of the white seed character in alfalfa.
Agron. J. 1956 : **48** : 449–51.

A white seeded plant of *Medicago sativa* was crossed with tan-seeded *M. sativa* plants and with colchicine-induced autotetraploid *M. falcata* plants. Segregation ratios obtained on back crossing to the white-seeded parent were in accordance with the hypothesis that white seed, which was associated with lack of anthocyanin throughout the plant, occurred only when all the genes at the colour locus were in the recessive condition *cccc* and when at least one dose of the colour-inhibiting gene *I* was present. The expected ratios were calculated on the basis that preferential pairing of the chromosomes bearing locus *c* took place in the pure *M. sativa* hybrids and random pairing in the *M. falcata* hybrids. Blue flower colour was governed by genes distinct from those for anthocyanin but required the presence of at least one dose of *C*. Genes for yellow flowers were independent of those for anthocyanin.

1891 **Severe yearlong drouth tests alfalfa survival.**
What's New Crops Soils 1956 : **9** : No. 2 : p. 24.

Severe drought conditions in western Canada have shown that creeping-rooted varieties, such as Rambler, have greater drought tolerance than tap-rooted varieties such as Grimm, Vernal and Ladak.

1892 FRANDSEN, K. J.
Variations in resistance of *Trifolium pratense* to attacks of *Kabatiella caulivora* (Kirchn.) Karak.
Friesia 1956 : **5** : 231–33.

Danish red clover stocks tested at Øtoftegaard, Sjælland, have shown marked variation in resistance to *K. caulivora*, suggesting that breeding for resistance may be possible.

1893 CHAKRAVARTY, A. K.
Artificial production of polyploids.
Bull. bot. Soc. Bengal 1955 : **9** : 14–16.

Tetraploids ($2n = 64$) of New Zealand Certified white clover were produced by treating germinated seeds with a drop of 1% colchicine applied daily between the cotyledons for about 14 days. Compared with the diploids, the tetraploids were more vigorous and on the average had larger pollen grains and stomata. Crosses of the tetraploids with Swedish tetraploid material were highly successful but those with diploid white clovers failed.

1894 MORLEY, F. H. W. & DAVERN, C. I.
Flowering time in subterranean clover.
Aust. J. agric. Res. 1956 : **7** : 388–400.

Differences have been observed in the flowering times of six subterranean clover varieties at different localities and experimental results indicate that these are due to differing photoperiodic and temperature requirements for flower initiation. It is suggested that the photoperiodic and temperature requirements of each strain may be related to the climate of their natural habitats and the value of a knowledge of these requirements in selecting for use in different localities is emphasized.

1895 Konstantinova, A. M.
(Breeding for improved protein content).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 9 : 4–6. [Russian].

Mention is made of a new variety of sainfoin which was selected for high protein content on the basis of a high leaf-stem ratio at Stavropolj.

1896 Hanson, C. H., Cope, W. A. & Allison, J. L.
Tar spot of Korean lespedeza caused by *Phyllachora* sp.: losses in yield and differential susceptibility of strains.
Agron. J. 1956 : **48** : 369–70.

In investigations at the North Carolina Agricultural Experiment Station, 34 F_1 selections of FC31850 x Rowan showed highly significant differences in infection with tar spot, leaf loss due to this disease, dates of flowering and maturity, and yields of hay and seed. The six lines in the most susceptible class were severely defoliated and ripened prematurely; they yielded only 30% as much seed as the four lines in the most resistant class.

1897 **Study *Lespedeza* photoperiod.**
What's New Crops Soils 1956 : **9** : No. **3** : p. 19.

The tannin content of the leaves of *L. cuneata* was found to increase with increasing photoperiods, although the increment differed in each of the varieties tested.

1898 Greenshields, J. E. R.
The coumarin story.
Agric. Inst. Rev. 1956 : **11** : No. **5** : 15–16, 54.

An outline is given of the methods used and the progress which has been made in breeding varieties of *Melilotus* with low coumarin contents in Canada. Interspecific crosses have been made between *M. alba*, *M. dentata* and *M. officinalis*, and a number of low-coumarin plants have now been produced from which selections will be made of those combining this character with other desirable agronomic characters. It has been shown that the gene conditioning the bound-coumarin content of the plant is inherited as a simple recessive and that the gene conditioning free-coumarin production may be present but undetectable in a coumarin-deficient plant.

1899 Wilson, M. C., Davis, R. L., Haws, B. A. & Thomas, H. L.
Attractiveness of sweetclover varieties to the sweetclover weevil.
J. econ. Ent. 1956 : **49** : 444–46.

In field tests in Minnesota and Indiana, Common White, Common Yellow and Spanish showed less injury due to attack by weevil (*Sitonia cylindricollis*) than Evergreen, Madrid and other varieties. The performance, however, of some varieties with respect to weevil injury differed in Minnesota and Indiana, possibly as the result of disparities in plant development. The apparent ability of the Wisconsin selections A–46 and S–65 to tolerate more damage than the other varieties in the tests in Indiana may be related to their inherent vigour. Varietal ratings for damage under field and greenhouse conditions in Indiana were closely correlated.

1900 Leonov, A.
(An experiment on cultivating the lupin in the province of Černigov).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 10 : 21–22. [Russian].

Nosovskiĭ Belosemjannyĭ [Nosovka White-seeded], a recent standard bred at the Nosovka Breeding Station, is mentioned. It is a sweet lupin distinguished by rapid growth and high yields of forage and seed.

1901 Kress, H. & Zachow, F.
Ergebnisse von Untersuchungen an kurzbehaarten und kleinsamigen Mutanten von *Lupinus luteus*. **(Results of studies on short-haired and small-seeded mutants of *L. luteus*).**
Züchter 1956 : **26** : 207–10.

The short-haired spontaneous mutant discovered in 1950 (cf. *PBA*, XXIII, Abst. 1276) and a short-haired mutant obtained in 1952 by X irradiation of the Gülzow sweet yellow lupin (cf. *PBA*, XXIII, Abst. 2771) were crossed with each other and with their parent strains and the F_1 and F_2 generations were studied. It was shown that two separate recessive genes are involved, designated *brevis* (*brev*) and *curtus* (*curt*) in the spontaneous and the induced mutants respectively. The new forms are likely to be useful for growing in districts with a maritime climate as the pods dry quickly and the quality of the seeds is consequently not impaired by damp. Two small-seeded mutants obtained by X irradiation (cf. *PBA*, XXIII, Abst. 2771) were also studied. In the one, the character small pods and seeds was associated with weak and spindly growth, possibly due to the action of a pleiotropic gene, and this mutant would appear to be useless for practical purposes. The other mutant, which had a 1000-grain weight of approximately 87 g., produced good yields of green fodder and should prove valuable as a green-fodder lupin. In each of the small-seeded mutants, the character small pods and seeds was determined by a single recessive gene.

1902 ATABEKOVA, A. I.
(Lupin chimeras originating by hybridization).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **106** : 725–28. [Russian].

Instances of chimeras, characterized mainly by darker seed colour, are reported from the Timirjazev Agricultural Academy. All the chimeras arose from heterozygous material, namely intraspecific hybrids of *Lupinus luteus* or *L. nanus* or interspecific hybrids between *L. mutabilis* and *L. ornatus*. It is thought that the phenomenon of darkening of the seed coat occurs only in chimeras originating by hybridization.

1903 KRESS, H.
Die Bedeutung einer neuen Gelblupinenzüchtung für die Qualitätsverbesserung unter den Bedingungen der Praxis. **(The importance of a new strain of yellow lupin in improving quality under practical conditions).**
Dtsch. Landw., Berl. 1956 : **7** : 424–25.

A new strain of Gülzow sweet yellow lupin with rapid early growth, soft seed-coats, indehiscent pods, pod hairs only 0·62 mm. in length and high seed production is described. As the pod hairs are exceptionally short they retain very little moisture and drying after harvesting is thus facilitated. The new strain, which does not require to be grown in mixed sowings with cereals to ensure optimum production of undamaged seed, lends itself to mechanical harvesting. It is readily distinguishable from other strains by the sulphur-yellow colour of its flowers, a character that has been bred into it to facilitate estimation of varietal purity.

1904 TOMASZEWSKA, Z.
Wstępne badania nad anatomią strąków łubinu. **(A preliminary study of the anatomy of lupin pods).**
Acta agrobot., Warszawa 1954 : **2** : 151–77.

L. albus 'Przebędowski Wczesny' [Przebędowo Early], which is resistant to shattering and pod shedding, had (*a*) pods with a narrower layer of thinner-walled fibrous cells and a thicker parenchymatous layer than nonresistant lupins, (*b*) stronger and more uniform sclerenchymatous elements in the pod suture and midrib and (*c*) broader peduncles with stronger nerves. Characteristics (*b*) and (*c*) were also shown by the resistant variety *L. luteus* 'Popularny' [Popular].

1905 KRESS, H. & ZACHOW, F.
Die Vererbung der weissen Kornfarbe bei der Gülzower Süssen Gelblupine und den Weiko-Typen (*Lupinus luteus*). **[The inheritance of white seed colour in the Gülzow sweet yellow lupin and the Weiko forms (*L. luteus*)].**
Züchter 1956 : **26** : 176–77.

Crosses were carried out between the white-seeded varieties Weiko I, II and III on the one hand and the Gülzower Süsse Gelblupine on the other; both types are derived from crosses between white-seeded mutants, found in 1932 and 1940 respectively, of Sengbusch's Süsslupine Stamm 8 [Sengbusch's sweet lupin Strain 8] and the shattering-resistant Müncheberger Stamm 3535A [Müncheberg Strain 3535A] (cf. *PBA*, XXVI, Abst. 2480). The seeds of the F_1 hybrids were all speckled, indicating that different genes for white testa, designated *niv* in the case of Weiko and *alb* in the Gülzower Süsse Gelblupine, were involved. Both genes are recessive and the gene *niv* exercises a pleiotropic effect (cf. *PBA*, XXVI, Abst. 2480). The F_2 plants segregated in respect of seed colour in the ratio 9 speckled : 7 white. The yellow flowers of the Gülzower Süsse Gelblupine proved dominant over the dark-violet flowers of Weiko in the F_1; the F_2 plants segregated in the ratio 3 yellow : 1 dark violet.

1906 **Mansfield trefoil yields run high in Vermont.**
What's New Crops Soils 1956 : **9** : No. 3 : 20–21.

High yields of dry matter and seed have been obtained in Vermont from a new birdsfoot trefoil variety, Mansfield, which is tolerant of cold but not of poor drainage. It flowers about ten days earlier than Empire and has dull green leaves and coarse stems.

1907 SMIRNOVA-IKONNIKOVA, M. I. & MUHINA, N. A.
(The forage value of *Lotus corniculatus*).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 9 : 24–28. [Russian].

Differences in the HCN content of a number of varieties are noted.

ROOTS AND TUBERS

1908 Filutowicz, A. & Bejnar, W.
Wyniki doświadczeń nad stosowaniem szczepień w rodzaju *Beta*. (**Results of experiments on the utilization of grafting in the genus *Beta***).
Acta agrobot., Warszawa 1954 : **2** : 69–80.

The progenies from seed of reciprocal grafts between sugar beet on the one hand and beetroot, mangel and *Beta trigyna* on the other were compared with those from the corresponding sexual crosses. Unlike the sexual hybrids, the progenies of the grafts were not intermediate in character between the parental forms, but self fertility and a lowering of the temperature required for germination were observed in grafts on *B. trigyna* stocks.

1909 Donà dalle Rose, A.
Probables relations entre pigmentation et cercosporiose dans *"Beta vulgaris"*. (**Probable relationships between pigmentation and *Cercospora* in *B. vulgaris***).
2e Réun. Étud. Cercosporiose, Zaragoza, 25–6–7 Nov. 1954; Pubbl. Sta. sper. Bieticolt, Rovigo 1954 : No. 30 : (unpaginated).

This article constitutes the French text of the paper summarized in Abst. 645.

1910 Heinisch, O.
Sortenmerkmale von Zucker-, Halbzucker- und Futterrüben im Stecklingsstadium zugleich ein Beitrag zur Feldanerkennung von Beta-Rüben. (**Varietal characteristics of sugar, half-sugar and mangels in the steckling stage, also a contribution to the field certification of beets**).
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : Pp. 28.

An illustrated account is given of the use of morphological differences in the leaf and root characters of sugar, half-sugar and mangel stecklings as an aid to the identification of varieties in the field. Among the criteria employed are leaf colour, shape and colour of the root, proportion of the root above the ground, the arrangement of the lateral roots and the number of vascular bundles in the cross section of the root.

1911 Kloen, D.
Tetraploïde voederbieten. (**Tetraploid mangels**).
Landbouwvoorlichting 1956 : **13** : 627–35.

Experiments at the Wageningen Plant Breeding Institute, Netherlands, on increasing the dry-matter yield of mangels by the induction of polyploidy are described and the effect of colchicine upon cell division and morphological criteria by which tetraploid seedlings may be distinguished are discussed. In addition to having a higher dry-matter content, tetraploid mangels have displayed greater resistance to bolting than diploids.

1912 Shibutani, S. & Okamura, T.
(**On the mode of coloration of coloured turnip varieties. II. The anthocyanins of coloured turnip varieties**).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1956 : **25** : 111–15. [Japanese].

Japanese pigmented varieties can be subdivided into two groups according to whether the pigmentation is caused by cyanin or pelargonin.

1913 **Informal Potato Conference at Wageningen, the Netherlands, from 8-12 August 1955** : (Mimeographed).

The 16 contributions to this international conference dealt chiefly with diseases, methods of storage, quality and physiological problems, including the application of growth-inhibiting chemicals. A paper on Research on common scab (*Actinomyces scabies*) at the IVK by B. Emilsson includes a survey of investigations on varietal reactions, categories of scab lesion and the nature of scab resistance at the Institutet för Växtforskning och Kyallagring [Institute for Plant Research and Cold Storage], Sweden. In A disease, caused by *Colletotrichum atramentarium*, in tubers of certain potato varieties, J. C. Mooi is mainly concerned with attack upon the variety Saskia in the Netherlands. O. Fischnich discusses the application of growth-promoting and growth-inhibiting substances on potatoes with special reference to its effect on storage and the identification of varieties by a study of the morphology of the sprouts (cf. *PBA*, XXVI, p. 456); he also gives information on optimum storage temperatures for different varieties (cf. *PBA*, XXVI, Abst. 2584).

1914 Cullen, J. C.
First early potato variety trials, 1950-55.
J. nat. Inst. agric. Bot. 1956 : **7** : 565–91.

Trials have been carried out at 25 centres of six varieties for the period 1950–55, seven other varieties being included for comparison in some or all of the trials. The field characters, reaction to disease and difference in earliness in relation to locality and cultural practices of the different varieties are discussed.

1915 MÖLLER, H.
Potatisförädling i Förbundsrepubliken Tyskland. (**Potato breeding in the Federal Republic of Germany**).
Tidskr. Lantm., Helsinki 1956 : **38** : 110–11.

An outline is given of the breeding work in progress in Western Germany under the auspices of the Max Planck Institute for Breeding Research, particular mention being made of breeding for resistance to blight, wart and virus diseases. Notes are provided on a number of registered varieties.

1916 STEFANOVSKIĬ, I. A.
(**Potato growing in the German Democratic Republic**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. **9** : 58–60. [Russian].

Breeding work on potatoes at Gross Lüsewitz is referred to and the principal early, midseason and late varieties grown in Eastern Germany are listed, with annotations on their starch and tuber yields, resistance to wart and viruses and soil requirements.

1917 THIJN, G. A.
Nieuwe aardappelrassen in Oost-Duitsland. (**New potato varieties in East Germany**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **13** : p. 88.

Potato breeding in East Germany since 1950 is reviewed briefly and a number of new varieties developed there in recent years are mentioned. Among them are Meise [Titmouse] and Drossel [Thrush], both of which are highly resistant to virus diseases and Amsel [Blackbird], Fink [Finch] and Schwalbe [Swallow], which are resistant to *Phytophthora infestans*. Star [Starling] has shown a high degree of resistance to both virus diseases and *Ph. infestans*.

1918 HÖPPNER, E. & GEIDEL, H.
Das Sortiment der Vorkeimsorten. (**The collection of potato varieties suitable for pregermination**).
Kartoffelbau 1956 : **7** : 176–77.

Tabulated data are presented on the tuber size, shape and uniformity, percentage of tubers suitable for marketing and resistance to *Phytophthora infestans* of the nine varieties of first-early potatoes included in the West German list of approved varieties. The information given is based on the results of trials conducted at a number of centres throughout the German Federal Republic in 1951–56.

1919 Eindresultaten van proefvelden met fabriekaardappelrassen in 1956. (**Final results from trial fields of industrial potato varieties in 1956**).
Pootaardappelhandel 1956 : **10** : p. 17.

The results of trials at 19 centres in the Dutch provinces of Groningen and Drenthe are summarized. Several new seedlings had a higher starch content than the standard Voran [Onwards].

1920 VAN HAERINGEN, G. H.
Practijk-ervaringen met het gebruik van *demissum*- en *andigenum* kruisingen bij het kweken van nieuwe aardappelrassen. (**Practical experiences with the use of *demissum* and *andigenum* crosses in breeding new potato varieties**).
Zaadbelangen 1956 : **10** : 269–70.

Breeding for resistance to late blight and eelworm by crossing cultivated varieties of *Solanum tuberosum* with *S. demissum* and *S. andigenum* respectively is discussed with reference to work carried out in the Netherlands by Mastenbroek (cf. *PBA*, XXVI, Abst. 501) and other potato breeders. The main difficulties encountered have been the constant recurrence of new physiological races of *Phytophthora infestans* and the preference of the consumer for the old susceptible varieties, which usually have a better flavour than new varieties obtained from crosses involving *S. demissum* or *S. andigenum*.

1921 **Issue on varieties.**
Potato News Netherlands 1956 : **6** : No. 2 : 1–20.

Abridged data, obtained from the Netherlands Descriptive list of agricultural crop plants (cf. *PBA*, XXVI, p. 701) and varietal reports issued by the Institute for Research on Varieties of Crop Plants (cf. Absts. 652–3), are provided for each of the Dutch and foreign potato varieties approved for cultivation in the Netherlands (cf. *PBA*, XXVI, p. 704). The particulars given include information on pedigree, maturity, yield, starch content, keeping and cooking properties, drought and disease resistance, rate of growth of the shoots and source from which seed may be obtained.

1922 MÜNSTER, J.
Assortiment officiel suisse des variétés de pommes de terre recommandables pour la culture en 1955–1956. (**Official Swiss collection of potato varieties that can be recommended for cultivation in 1955-56**).
Paysan fribourgeois 1955 : No. 52; Publ. Sta. féd. Essais agric., Lausanne 1955 : No. 491 : 1–12.

Brief data are presented as to resistance to virus diseases, *Synchytrium endobioticum*, *Phytophthora infestans* and other diseases, maturity group, cooking quality, starch content and colour of skin and flesh of 17 varieties recommended for cultivation in Switzerland.

1923 LHOAS, P.
Recherches cytogénétiques sur les *Solanum*, section *Tuberarium*. V. Analyse statistique des chromosomes somatiques et relations phylogéniques. (**Cytogenetical investigations on *Solanum*, section *Tuberarium*. V. Statistical analysis of somatic chromosomes and phylogenetic relationships**).
Cellule 1956 : **57** : 355–68.

Measurements of the length and diameter of the chromosomes of 14 species belonging to the series *Demissa*, *Tuberosa*, *Acaulia* and *Commersoniana* showed that these criteria were unreliable in establishing phylogenetic relationships between species. The length and diameter of the chromosomes were, however, inversely correlated with chromosome number. (Cf. Absts. 664–5).

1924 PERLOVA, R. L.
(**Biological characters of various potato species**).
Trud. Glavnogo Bot. Sada (Trans. Princ. Bot. Gdn.) 1951 : **2** : 217–63. [Russian].

Reference is made to differences in frost resistance, photoperiodic reaction, length of developmental period, disease resistance, content of dry matter, protein, vitamin C and other constituents and chromosome number among the potato species, cultivated and wild, of South America. Observations made near Leningrad showed that the rate of transpiration was higher in some of the wild species than in Epicure; thus it was 186% higher in *Solanum commersonii*, 27% higher in *S. leptostigma*, 73% in *S. punae*, 34% in *S. demissum*, 186% in *S. vallis-mexici*, 90% in *S. antipoviczii*, 128% in *S. jamesii* and 77% in *S. edinense*. The Peruvian species *S. vavilovii* had an exceptionally high transpiration rate, losing 2·11 g. of water per hour under conditions where *S. catarthrum* lost 1·466 g., the variety Long Keeper 0·826 g. and Early Puritan 1·042 g.; *S. vavilovii* proved unusually tolerant of drought. On the other hand *S. medians*, which like *S. vavilovii* is found in the vicinity of Lima in Peru, had a very low rate of transpiration, as had *S. maglia* from Chile, whereas two other Chilean species, *S. brevidens* and *S. looseri*, had much higher rates.

The species found to be most tolerant of drought were *S. commersonii*, *S. vallis-mexici*, *S. jamesii*, *S. maglia* and *S. vavilovii*, all of which come from arid regions. These species were also found to have the deepest roots, diagrams being provided showing the characteristic root system of each species. No correlation was observed between drought resistance and size and number of stomata, development of the palisade tissue, venation of the leaf or its pubescence.

Similar observations on the indigenous cultivated species showed them all, with the exception of *S. rybinii*, to have less extensive root systems though they had a larger number of deep roots. There was no correlation between extent of root system and rate of transpiration, which was highest in *S. rybinii*, *S. phureja*, *S. stenotomum* and *S. mamilliferum*. The most drought-resistant of this group was *S. rybinii*.

In *S. andigenum* variation was observed between different forms in respect of rate of transpiration and other features, some being close to Epicure in transpiration rate and some as much as 140% above it; in this species there was a close correlation between extent of root system and resistance to drought. Data are given for 35 of the varieties of domestic potato most commonly grown in the Soviet Union; some of these had transpiration rates up to 150% above that of Epicure; late varieties had deeper and more vigorous root systems than early varieties but within each group there was a correlation between drought resistance on the one hand and extent of root system and transpiration rate on the other.

When grown at an altitude of 2320 m. in the Pamir most species flowered more freely and bore more fruits and seeds, even many species which at Leningrad or Moscow had been classed as sterile, including *S. semidemissum* and *S. edinense* and a number of interspecific hybrids. All species showed greater cold resistance, conditioned by a higher content of soluble carbohydrates, though the increase was more in some species than in others. Details are given of the behaviour of the species from different ecological regions when grown in the Pamir. Tuber formation was observed in a number of species and hybrids which failed to produce them in the plains. In the wild species a correlation was observed between drought resistance, as observed in *S. vallis-mexici*, *S. maglia*, *S. jamesii* and *S. commersonii*, and high osmotic pressure in the roots; this correlation did not hold however for the cultivated species. Higher vitamin C contents were observed in the tubers of most species and varieties when grown in the Pamir.

It is pointed out that the changes in behaviour of the species when brought to this high-altitude desert are adaptive in nature and are more evident in the second tuber generation than the first; as a result of gradual adaptation potatoes can now be grown at greater altitudes still, namely up to 3860 m. in the eastern Pamir.

1925 MÖLLER, K.-H.
Sämlingsanzucht im Gewächshaus zur Züchtung frühreifer Kartoffeln. (**Raising seedlings in the greenhouse in breeding early-maturing potatoes**).
Züchter 1956 : **26** : 243–48.

The method described consists of sowing seeds from intervarietal crosses in the greenhouse and subjecting the resulting seedlings to selection for earliness. The earliest plants are retained and their tubers planted out the following year for further selection. Of the crosses carried out, Vera x Comtessa gave the highest percentage of early-maturing seedlings. It was shown that the percentage of early-maturing seedlings obtained from a given cross does not vary according to the direction of the cross (cf. *PBA*, XXVI, Abst. 2564).

1926 BERNADOWSKI, J.
Próby zwalczania bezpłodności ziemniaka. (**Experiments on overcoming sterility in the potato**).
Acta agrobot., Warszawa 1954 : **2** : 3–19.

Increases in flowering and fruiting were induced in Dar, Bern, Erstling, Oka, Alma, Deodara, Jubel and Ulster Chieftain by removing leaves and side shoots, by picking the young tubers and by other mechanical injuries but were small and inconsistent. Marked improvements in flowering and the production of fertile pollen were observed in Ulster Chieftain, Erstling and *Solanum curtilobum* when grafted on to tomato stocks. When *S. saltense*, *S. rybinii*, *S. stenotomum*, *S. andigenum* and *S. malinchense* were grafted on tomato, the pollen from scions growing on stocks with one to four young shoots developed appreciably longer tubes than that from ungrafted plants or from scions on stocks with no shoots or old shoots only. Aerial tubers were produced only when the stock had no shoots, more than four young shoots or old shoots that flowered and bore fruit. Scions of Ulster Chieftain, Erstling and *S. rybinii* produced aerial tubers and no flowers when the stocks had old shoots or no shoots but produced fruit and no aerial tubers on stocks with two or three young shoots.

1927 BENVENUTI, A.
Rilievi sulle caratteristiche e sul valore produttivo dei tuberi di patata in rapporto alla conservazione. (**Points concerning the characteristics and productive capacity of potato tubers in relation to their mode of keeping**).
Agricoltura ital. 1955 : **55** : 1–19.

All varieties tested gave the best results when grown in the mountains, with the exception of San Michele, which was best when grown in the plains and kept in the mountains.

1928 TOXOPEUS, H. J.
Collecting cultivated potatoes in South America for potato breeding.
Euphytica, Wageningen 1956 : **5** : 97–100.

The substance of this article was summarized in *PBA*, XXVI, Abst. 3487.

1929 WEISÆTH, G.
Frostresistente potetarter fra Sør-Amerikas potetflora. (**Frost-resistant potato species of the potato flora of South America**).
Norsk Landbr. 1956 : 491–93.

In the third article in this series (cf. *PBA*, XXV, Abst. 3196–7) a popular survey of frost-resistant species from South America is presented, special mention being made of *Solanum vernei*, *S. curtilobum*, *S. stenotomum* and varieties of *S. andigenum*. The need for developing day-neutral varieties for northern Europe and the difficulties of breeding are briefly discussed.

1930 WEISÆTH, G.
Frostresistente potetarter. (**Frost-resistant potato species**).
Norsk Landbr. 1956 : 528–30.

In the fourth and last article in this series (cf. Abst. 1929), the characteristics of the following frost resistant species, mainly from the Andes, are surveyed and their use in breeding hardy varieties for Scandinavia is indicated: *Solanum curtilobum*; *S. vernei*, which is also resistant to root eelworm; *S. sanctae-rosae*; *S. acaule*, some clones of which are immune from virus X; *S. millanii*, from which segregates resistant to Colorado beetle have been obtained; and the dry-rot resistant species *S. demissum*.

1931 DUDARJ, N. G.
(**Training seedling potatoes for hardiness**).
Agrobiologija (Agrobiology) 1956 : No. 3 : 121–24. [Russian].

The new high yielding potato varieties D/3–17, D/3–5–13 and D/3–21, the first two notable for tolerance of frost, were obtained by interspecific vegetative-sexual hybridization at the Kalinin Agricultural Institute, Crimea. The initial material was in each case the same, but D33–17 and D/3–5–13 had additionally been trained for hardiness. The treatment consisted of subjecting young plants alternately to temperatures of 19–20° C. and temperatures below zero for a period of 25 days. The plants were then transferred to rich soil.

1932 EMILSSON, B. & HEIKEN, A.
Studies on the development and structure of the periderm of the potato tuber in relation to scab resistance.
Acta agric. Scand. 1956 : **6** : 229–42.

In confirmation of the results obtained by Cooper *et al.* (cf. *PBA*, XXIV, Abst. 3125), studies of 11 varieties ranging from resistant to highly susceptible showed that the periderm of resistant varieties consisted throughout of cells with large well-developed nuclei whereas that of susceptible material generally consisted of cells with small degenerate nuclei underlying several layers of dead cells. The highly susceptible variety Eigenheimer was exceptional in having nucleate cells throughout the periderm, the nuclei being small but showing no sign of degeneration.

1933 ŚWIEŻYŃSKI, K.
Nowa methoda selekcjonowania ziemniaków na odporność na zarazą ziemniaczaną (*Phytophthora infestans* de Bary). [**A new method of selecting potatoes for resistance to infection by blight (*Ph. infestans* de Bary)**].
Acta agrobot., Warszawa 1955 : **3** : 13–26.

The method involves immersing potato seedlings grown on damp blotting paper in a suspension of the fungus spores. By using different spore concentrations, potatoes with various degrees of resistance may be distinguished and the method may also be used as a means of rigorous selection since at high concentrations even highly resistant lines may be killed.

1934 PRISTOU, R. & GALLEGLY, M. E.
Differential reaction of potato hosts to foreign and domestic potato physiologic races of *Phytophthora infestans*.
Amer. Potato J. 1956 : **33** : 287–95.

This article provides a more detailed account of a study previously reported in *PBA*, XXV, Abst. 2143.

1935 STEVENSON, F. J., AKELEY, V. & HAYNES, F. L.
Plymouth. A new variety of potato, immune from the common race of the late blight fungus, moderately resistant to common scab, and adapted to the tidelands of North Carolina.
Amer. Potato J. 1956 : **33** : 296–99.

The above variety was selected from a cross between Mohawk (Katahdin x Green Mountain) and USDA Seedling 96–56 (Earlaine x USDA Seedling 3895–13). It has given higher yields than Irish Cobbler and Sebago in the tidewater region of North Carolina, where it is early maturing, and has outyielded four other varieties in Maine, where it is of medium maturity. The tubers are smooth, have shallow eyes and are of good chipping quality. It is immune to the common race of *Phytophthora infestans* and moderately resistant to *Streptomyces scabies*.

1936 KULMATYCKA, I., LESZCZENKO, P. & MALEC, K.
Rizoktonioza ziemniaków. (***Rhizoctonia* disease of potatoes**).
Acta agrobot., Warszawa 1955 : **3** : 27–43.

Of the potatoes tested during 1951–53 at the Bydgoszcz and Wtelenko stations for potato-disease research, Poland, Lenino, Panna and Unikat proved to be moderately resistant and the rest susceptible to *Rh. solani*. Breeding for improved resistance is in progress.

1937 QUEVEDO DÍAZ, A., SIMÓN F., J. E. & TOXOPEUS, H. J.
Estudios de resistencia a la "anguilula dorada" de la papa. (**Studies of resistance of potato to the golden eelworm**).
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 347 : 10–15. (Mimeographed).

Tests were made on 80 first back-cross seedlings of a cross of *Solanum andigenum* CPC1673 received from the Netherlands, where the seedlings had been classed as resistant. When grown in Peru on soil infested with *Heterodera rostochiensis* none of the seedlings remained free from attack but No. 51, whose parentage is Record x (Black 1256 x Libertas) x *S. andigenum*, showed a lower infestation than all others, forming only 7 cysts on the whole root system.

1938 Bukasov, S. M. & Lebedeva, N. A.
[Breeding the potato for resistance to Colorado beetle (*Leptinotarsa decemlineata* Say.)].
Koloradskiĭ Žuk i Mery Borjby c nim. (Colorado beetle and methods of controlling it). Moskva 1955 : 118–33. [Russian].

The method used in testing resistance to Colorado beetle is described. *Solanum jamesii*, which has been referred to as a resistant species, is not entirely immune and is not considered promising for breeding purposes. Some forms of *S. demissum* have displayed resistance of varying degrees or are toxic to the insects that feed on them; the degree of resistance diminishes greatly however in hybrid generations obtained from these resistant forms. *S. polyadenium* has an unpleasant smell and so, it is thought, has the group *Cardiophylla*, though in this case the smell is not detectable by man. The Argentine group *Glabrescentia* is also inimical to the insects, although most species of this group do not contain demissin. The most resistant forms of all have been found in *S. gibberulosum* and *S. horovitzii*. In *S. bergeri* some seedlings were found in which the leaf lamina remained quite free from attack and the insects ate only the petiole and stems. Some of the species in group *Acaulia* contain solacaulin and display a certain degree of resistance; this applies to *S. depexum*, *S. schreiteri* and certain seedlings of *S. punae* x *S. tuberosum*.

When *S. demissum* is used as a resistant parent the resistance is invariably lost by the second or third back cross. This did not happen to the same extent with *S. gibberulosum* and *S. parodii* crosses, which retained a quite high degree of resistance in the second back cross. The opinion is expressed that much valuable material still remains in the countries of Latin America and that further collections should be made there, particularly in Argentina, with the object of finding suitable parental material for breeding potatoes resistant to Colorado beetle and also to *Epilachna vigintioctomaculata*.

1939 Kassanis, B.
Serological relationship between potato paracrinkle virus, potato virus S and carnation latent virus.
J. gen. Microbiol. 1956 : **15** : 620–28.

It is suggested that potato paracrinkle virus, potato virus S and carnation latent virus are serologically related and have evolved from a common aphid-transmitted ancestor, although they differ considerably in their host range and pathogenicity. They possess some antigens in common together with many specific ones and minor variants of paracrinkle and virus S have been detected. No plant of King Edward was found free from paracrinkle virus, and none of Arran Victory free from virus S.

1940 Steineck, O.
Tageslänge und Knollenbildung bei Kultursorten der Kartoffel. (**Day length and tuber formation in cultivated potato varieties**).
Z. Pflanzenz. 1956 : **36** : 197–213.

Experiments carried out at the Institute for Horticulture and Plant Breeding, Vienna, indicated that the cultivated potato is normally a short-day plant, tuber formation being inhibited when the critical day-length of a particular variety is exceeded. Although each variety has its own particular photoperiodic requirements, these requirements may not become apparent in the day-length conditions of the region in which the variety is grown (cf. *PBA*, XXVI, Abst. 3113); in such cases the variety in question will appear to be day neutral and will not give as high a yield as could be attained if its critical day-length were reached. The six midearly to late varieties tested at the institute could be divided into three groups on the basis of their reactions to 12 hr., 14 hr. and normal day-lengths from 28 April to 25 June. In the first group, a shortening of the photoperiod to either 14 or 12 hr. led to an increase in tuber yield and to a decrease in the incidence of nonproductive stolons. Plants of this group were therefore classified as having a short critical photoperiod. In the second group, optimum yield was obtained under normal day and 14 hr. photoperiods; yield was depressed under a 12 hr. photoperiod owing to a reduction in the amount of foliage and to a shortened period of photosynthesis. In the third group, plants grown under either a 12 hr. or a 14 hr. photoperiod produced less foliage and fewer tubers than those grown under normal-day conditions. Such plants were therefore classified as having a long critical photoperiod. In breeding, the development of varieties with a long critical photoperiod is advocated as such varieties are best adapted to utilize long photoperiods to the full and yield depressions due to too long a day length are unlikely. It is possible to select plants with a long critical photoperiod in the juvenile state.

1941 Le Marchand, G.
La sélection de la patate douce à Mulungu. (**Sweet-potato breeding at Mulungu**).
Bull. INÉAC 1956 : **5** : 237–54.

Work at the Mulungu-Tshibinda Research

Station, Belgian Congo, on breeding new varieties suitable for cultivation in the Kivu region is outlined. Clones 5037, 5237 and 6104, obtained by selection and hybridization, combine high yielding capacity with resistance to virus diseases, good adaptability to various ecological conditions and attractive flavour and appearance. In yield, they are comparable with the foreign varieties Caroline Lee, Porto Rico and Mugenda.

1942 Harmon, S. & Woodard, O. J.
Earlysweet sweetpotato introduction.
Mimeogr. Ser. Ga. agric. Exp. Sta. 1956 : No. 28 : Pp. 4.

The high-yielding early variety Earlysweet, released for cultivation in Georgia, has cream-coloured skin and deep-orange flesh with a fibre-free uniform texture, high sugar content and good cooking quality. It is tolerant of stem rot but less resistant to nematode than Porto Rico or Georgia Red. It has the disadvantages of rapid deterioration if left in the soil too long and of susceptibility to cracking. It was developed at the Georgia Coastal Plain Experiment Station, its parentage consisting of Cliett Bunch Porto Rico and unnamed lines.

1943 McConnell, E. R., Gottschall, P. B. (Jun.) & Huffington, J. M.
Influence of variety and storage on the quality of canned Louisiana sweet potatoes.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 493–503.

The authors report the results of tests on the quality of Allgold, Earlyport, Goldrush, Heartogold, Kandee, Nemagold, Jersey Orange (a selection of Orlis), Porto Rico, Shoreland and Sunnyside when canned in syrup and by the vacuum method, using both freshly dug samples and roots stored for 1 or 3 months.

1944 Huffington, J. M., McConnell, E. R. & Gottschall, P. B. (Jun.).
Sweet potato varieties for canning: influence of storage on quality.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 504–13.

Varieties grown in Maryland were tested for their canning quality, using freshly dug roots and samples stored for 1 month and the syrup and vacuum methods of packing.

1945 MacNair, V.
Allgold and Golden Belle—rich in carotene and ascorbic acid.
Arkans. Fm. Res. 1956 : **5** : No. 3 : p. 11.

The information contained in this article has already been summarized from another source (cf. Abst. 686).

1946 Nishikado, Y., Hiura, U. & Ikuta, Y.
(On the sweet-potato disease caused by *Macrosporium bataticola*).
Nogaku Kenkyu/Rep. Ōhara Inst. agric. Res. 1947 : **37** : 54–56. [Japanese].

This account of the above disease includes data on the relative susceptibility of a series of Japanese varieties.

FIBRES

Progress reports from experiment stations, season 1954-55.
Emp. Cott. Gr. Corp. Lond. 1956.

1947 *Hutchinson, J. B. Survey of progress reports for the season 1954–55. (pp. 1–12).*

Cotton breeding is among the activities briefly reviewed.

Cotton Research Station, Namulonge, Uganda. Progress report for the season 1954–55.

1948 *Evenson, J. P. Lint physiology. (pp. 21–24).*

Details of the investigations reported have been given elsewhere (cf. *PBA*, XXVI, Abst. 2632).

1949 *Wickens, G. M. & Logan, C. Plant pathology. (pp. 30–35).*

Raw seed is preferable to acid-treated in testing susceptibility to primary seed-borne infection with bacterial blight (*Xanthomonas malvacearum*); acid treatment modifies the seed coat and strains of cotton may be differentially affected.

Strains of Domains Sakel carrying b_2b_3 or B_2B_3 were again usually more susceptible to bacterial blight than the corresponding forms of Upland. Domains Sakel B_2B_{6m} again showed a very high degree of resistance, surpassing that of Albar 49. Experiments partly designed to develop improved methods of large-scale inoculation with *Verticillium dahliae* for use in breeding revealed that a more reliable assessment of reaction was obtained when plants were inoculated at the age of 4 weeks instead of 6 weeks and later. Severe symptoms developed in highly resistant varieties as V135 with inoculation at the age of 4 weeks.

1950 *Faulkner, R. C. Plant Breeding. (pp. 35–41).*

The mean yield of lint of individual plants selected from the modal bulk 7MB of BP52 was about 1% higher than that of the total number of plants subjected to selection; this increase raises the theoretical cumulative total increment over the original bulk to approximately

29% (cf. *PBA*, XXVI, Abst. 1448). In work on the improvement of BP52 by progeny-row breeding, the mean yield of the 14 progenies selected in the season under review was 7% above that of 7MB. In small-scale trials of bulks of selected progenies, the mean advances in yield over the control 6MB were 28% and 12% in the early and late-sown trials respectively; the results of lint tests of this material were in the main satisfactory; a new multiline strain (BPQ) was made up of the best progeny bulks of C(53) for testing. The multiline strain NC54 (cf. *loc. cit.*) and the three progeny bulks C(50)20, C(52)16 and C(52)18 did not differ significantly in yield from the control 6MB in district trials. These three progeny bulks are to form the basis of a new multiline strain, NC55. Selection of Albar 51 and BP52 for lint properties and resistance to the stem phase of bacterial blight continued. Future breeding for bacterial-blight resistance will however probably be concentrated on (MU8 x BP52^2) x Albar 51 which offers considerable scope for selection for resistance to both this disease and jassid and also for lint length and ginning outturn; direct and back-cross derivatives of this combination are to be known as UPA strains. Roguing plants susceptible to *Verticillium* wilt over a period of several seasons has succeeded in building up a high degree of resistance in B181 x BP50 progenies but not in Albar 51; before inoculation with *Verticillium* this material was rogued for susceptibility to bacterial blight after stem inoculation.

Tanganyika Territory, Lake Province. Progress report for the season 1954–55.

1951 *Peat, J. E. & Brown, K. J. General account of the work for the season.* (*pp. 3–14*).

Uk55, a new addition to the Uk series of composite seed issues developed by selection of Mwanza Local, was released for multiplication; its component strains, 0/334 and 1/667, each outyielded Uk48 and Uk51 in the main trials at Ukiriguru and Lubaga and in the district trials (cf. *loc. cit.*).

1952 *Arnold, M. H. Diseases.* (*pp. 14–21*).

Further progress has been made in selecting for bacterial-wilt resistance and other characters in back crosses of Ukiriguru strains x Albar 51; an adequate level of yield has been restored after one or two back crosses; second and third back crosses have closely resembled their Ukiriguru parents in habit and jassid resistance. The programme of incorporating B_{6m} into Ukiriguru strains has reached the first back-cross stage.

1953 *Smith, R. Tanganyika Territory, Eastern Province. Progress report for the season 1955.* (*pp. 1–9*).

Selection of local material continued, jassid resistance now being one of the main characters receiving attention.

1954 *Hastie, M. S. Kenya, Nyanza Province. Progress report for the season 1954–55.* (*pp. 1–7*).

In trials at Kibos and Homa Bay, Uk53 outyielded S47, Uk48 and Uk51 but its superiority was not significant.

Sudan. Progress report of the cotton breeding stations, season 1954–55.

1955 *Rose, M. F. & Hughes, L. C. The Gezira Station.* (*pp. 2–12*).

A large-scale programme of hybridization has been undertaken with the aims of (1) increasing variability in B_2B_3 types belonging to the S and L groups of Egyptian cotton (cf. *loc. cit.*), (2) transferring leaf-curl resistance from L to S types and (3) improving L types which carry B_2 and B_3 but which are inferior to X1730A and BAR XL1 in both yield and quality.

Further work was carried out on the transference of lint retention from *Gossypium contextum* to the Sakel type BLR 14/25 and the building up of salt tolerance in the latter type.

Wind assisted very little in gene flow in the Gezira, where bee and other insect pollinators are absent.

In *G. hirsutum* 'BAR7/8.2' random crossing by brush pollination resulted in seed which outyielded naturally pollinated seed by 11%; this extra yield was apparently due to an increased number of bolls per plant.

1956 *Dark, S. O. S. & Saunders, J. H. Shambat Station.* (*pp. 12–18*).

Progress is reported in transferring B_{6m}, an intensifier of black-arm resistance originating in *G. arboreum*, to BLR14/25 (B_2B_3) and the X1730 types BAR4/16 (B_2B_3) and BAR5/6 ($B_2B_3R_2^{RS}$) of Egyptian cotton. Transference of B_{6m} from synthesized Sakel strains to derivatives of BP52 and to other Upland types homozygous for B_2 or both B_2 and B_3 also continued successfully.

In breeding for jassid resistance, transference of sufficient hairiness from *G. hirsutum* to *G. barbadense* has reached the stage at which four lines have been chosen for inclusion in variety trials at Medani in the coming season. These stocks carry H_1, reinforced in two of them by minor factors from Ferguson and in the other two by minor genes from MU8b. Transference of the full degree of hairiness of MU8b to Sakel and incorporation of jassid and black-arm resistance in the Upland variety Wilds SUS16/1 continued. The hairiness of the veins, petioles and stems in Sakel stocks is determined by a distinct major gene (H_3); H_1 is now regarded as a gene whose effect is restricted to the hairiness of the lower surface of the leaf lamina.

Transference of the character of 4-locular and 5-locular bolls from the Upland cottons Ferguson, Stoneville 20, Clevewilt 7, Punjab 268F, Punjab 244F and Pubescent T611 to BLR14/25 is in progress.

In work on imparting a higher number of ovules per locule from *G. auritum* to BLR14/25, the mean ovule number of the BC_3 families N39/54 and N40/54 exceeded that of BLR14/25 by 5% and 9% respectively, their mean maximum lint length being 44·2 mm. and 44·6 mm. respectively. Individual plants had lint lengths up to 48·0 mm. and high numbers of ovules. Family bulks from these two lines are to be tested at Medani against BLR14/15 to determine whether increase in ovule number has an advantageous effect upon yield. Since ovule number is probably under polygenic control, further increases will be sought by combining lines.

Using the Sakel type BLJR14/29 ($B_2B_3H_1$) as recurrent parent, transference of high lint strength from *G. thurberi* continued.

The resistance of *G. thurberi* to pink and Egyptian bollworm has been transferred to the Upland variety BAR11/7 (B_2B_3), but in the attempt to make use of the bollworm resistance of *G. armourianum* via *G. armadense*, sterility has prevented back crossing (cf. *loc. cit.*).

The possibility of improving the lint quality and strength of BAR7/8.2 and BAR11/7 by introgression of factors from Hopi Acala is being explored.

Since filtering has not led to the desired resistance to leaf curl in Sakel stocks, improvement in the technique of selection is being sought.

Use of paper bags protected the seed from bollworm attack in selfing and crossing and had an especially beneficial effect on the boll set of crosses.

1957 *Rose, M. F. & Low, A. Kadugli Station.* (*pp. 18–25*).

G. hirsutum 'BAR11/7' a derivative of XA129 (a selection of Pump Scheme Strain), has been filtered for quality and yield. Selection of BAR7/8 [BAR SP84 (B_2B_3)] to reduce its excessive seed-coat neppiness was initiated.

1958 *Ducker, H. C. Nyasaland. Cotton Experiment Station, Chitala. Progress report for the season 1954–55.* (*pp. 1–10*).

CLB, but not CL20, offers scope for reselection in which emphasis is to be laid upon ginning outturn. Since 1952 crosses of Albar 49 with BP52 and CL20 have been grown in panmixis plots where they have been heavily rogued for susceptibility to jassid and bacterial blight. Single plants have now been selected from the F_4 material; the selections are similar to CLB derivatives in range of ginning percentage but slightly superior in halo length.

1959 *King, H. E. & Lawes, D. A. Northern Nigeria. Progress report for the season 1954–55. Plant breeding.* (*pp. 4–12*).

Reselection and testing of material derived from Samaru 26C and its relatives continued. A probable successor of Samaru 26C, to be known as Samaru 26J, did well in both yield and spinning tests. Hybridization was initiated, using 26I, BAR D28 (a derivative of Allen), MU8A, BP52 and Albar 474 as parents. Mass hybridization according to the panmixis system was also initiated, using these varieties and Wilds SUS 16/1.

1960 *Anson, R. R. Aden Protectorate. Abyan Cotton Experiment Station. Progress report for the season 1954–55.* (*pp. 1–8*).

Hybrids between Wilds Early and 1730A were back-crossed to 1730A with the object of developing a strain resistant to *Rhizoctonia* wilt (cf. *loc. cit.*). Seed improvement of X1730A cotton by means of the production of bulked filters is giving encouraging results in commercial sowings. In varietal tests, BARXL–1 gave the best performance, surpassing the control by 20% in lint yield.

1961 *Lochrie, J. V., Spence, J. R. & Cave, C. T. West Indies. Cotton Experiment Stations. Progress report for the season 1954–55.* (*pp. 1–22*).

Selection of V135, VH8, VH10 and MSI continued.

(Summary of work of the All-Union Cotton Research Institute for 1954. II. Breeding and seed production of cotton and perennial herbaceous plants). Taškent, 1956 : Pp. 102. [Russian].

1962 *Straumal, B. P. (Breeding new high-yielding, early, medium-linted varieties of cotton adapted to the soil and climatic zones and suitable for mechanized harvesting).* (*pp. 7–29*).

The new variety S–1581 has exceeded the

standard 108–F in yield of raw cotton by amounts varying from 6·5% to 12·6%; it ripens at the same time or 1–2 days earlier and exceeds 108–F in ginning outturn by 1·5–2% and in lint length by 1·5–2 mm.

Several promising varieties with determinate branching are mentioned, some of them being said to shed their leaves when the boll is ripe. Others are mentioned on account of resistance to wilt and gummosis, earliness, size of boll, ginning outturn or lint quality; S–5406 is 5 days earlier than 108–F, has a lint length of 34–35 mm. and exceeds 108–F by 10–20% in yield, producing more of its yield before the onset of frosts; several other hybrids are mentioned for this same quality. S–9014 was 17 days earlier than 108–F but yielded 11% less. A natural hybrid of Upland with *Gossypium barbadense* matures 5–7 days before 108–F and has naked seeds, a lint length of 35–36 mm. and ginning outturn of 35–36%. Two varieties with brown lint have exceeded 108–F by 4–5% in yield; those with green lint are all low in yield.

Two hybrids of *G. hirsutum* x *G. herbaceum* are promising in respect of earliness, yield and lint properties.

Reports are presented from the zonal research stations for the different cotton-growing areas. From the Fergana station the hybrid 144–F, involving four different varieties in its parentage, is mentioned as being free from lodging and suitable for mechanical harvesting; it has a lint length of 31–32 mm. and has exceeded 108–F by 5–14% in yield. Other hybrids are mentioned for earliness, resistance to wilt and gummosis, lint length, determinate habit and shedding of leaves at maturity. At the Buhara station varieties tolerant of salinity have been produced and varieties improved in earliness or yield are reported from the Kara-Kalpak, Horezm, Kazah, Kirgiz, Tadžik and Turkmenia stations.

1963 *Avtonomov, A. I. & Hutornoĭ, Ju. P.* (*Breeding cottons with fine lint*). (*pp. 30–35*).

Variety S–6002, obtained by crossing a perennial Peruvian cotton with the fine-linted Soviet variety 2IZ, matures 8–12 days before the standard 10964, excels it considerably in yield, has a ginning outturn of 34–35%, lint length of 39–112 mm., boll weight of 4·0–4·3 g. and high resistance to *Fusarium* wilt. Other promising hybrids have been obtained from crosses of *Gossypium barbadense* 'Pima' x *G. hirsutum* 'Navrockiĭ'; 5010–B from *G. barbadense* x the Peruvian cotton is distinguished by high yield and earliness and several hybrids are mentioned as having determinate growth habit, early maturity and good lint qualities combined, in some cases, with resistance to *Fusarium* wilt or the property of shedding the leaves at maturity.

1964 *Arutjunova, L. G.* (*Directed change of nature in cotton*). (*pp. 36–49*).

The experiments described showed that when cotton seeds were sown at low temperatures selection of those seeds which tended to be delayed in germination occurred, this difference being perpetuated also in the offspring. Vernalization at 10–12° C. caused an increase in earliness of maturity of from 1 to 6 days and by selecting the individuals that germinated first a line of variety S–460 was produced which was 10–12 days earlier than the original variety in maturity. Selection under these conditions performed on the hybrid progeny from S–1472 x S–4520 led to the production of a line characterized by extreme earliness.

A perennial Peruvian cotton *Gossypium barbadense* '01277' and the Soviet variety *G. hirsutum* 'S–1470' and their hybrid were grown under a 10-hour day and in this way hybrids maturing 15 days earlier than those from crosses grown under a normal day were obtained.

Experiments with mixed pollen showed that addition of self pollen from the flower being pollinated increased the number of hybrids produced in crosses whereas pollen from different plants of the same variety increased the number of maternal types in the progeny. The success of intervarietal pollinations was increased by adding *Hibiscus* pollen to that of the pollinating variety, weight of boll, earliness and other properties of the progeny being improved at the same time. Pollen of *G. herbaceum* also increased the earliness of the progeny of intravarietal crosses of Soviet varieties of *G. hirsutum*.

1965 *Pudovkina, Z. M. & Tribunskiĭ, A. N.* (*Biological properties of development of varieties and hybrids of cotton under different lengths of day*). (*pp. 50–56*).

Early varieties showed little or no change when grown in short days or in continuous light, whereas medium and late varieties matured earlier under short days and later or not at all in continuous light. F_1 hybrids between late and early varieties showed a greater acceleration in maturity in short days (10–14) days than the parents (8–10 days) and hybrids between two late varieties showed a greater acceleration still (12–16 days).

The F_2 generation from F_1 plants grown in short days matured early even when grown under conditions of natural daylight and the F_2 from F_1 plants grown in long days matured late.

1966 *Gubanov, G. Ja. & Bredihina, A. I.* (*Study of the nature of wilt resistance in cotton*). (*pp. 57–63*).

Varieties known to be resistant to *Verticillium* wilt were found to contain more starch and less β glycosides, in the form of phenols and flavones in the woody tissues. Addition of such substances, as for example quercetin, to a culture medium stimulated the development of the fungus.

1967 *Gricenko, T. G.* (*Summary of research work on breeding and seed production of lucerne at the research stations of Sojuz-NIHI* in *1948–1954*). (*pp. 85–102*).

Observations made on 3782 lines of *Medicago sativa* comprising both Soviet and imported varieties have shown that the local forms from some of the Soviet territories of Central Asia provide useful material for breeding on account of their lateness, slow spring growth, prostrate habit and cold resistance. No improvement was effected by individual plant selection, which led to a reduction of yield of 3–22·8%. Mass selection, though not causing a reduction in yield, also failed to improve it. These failures are ascribed to the disturbance of the biological harmony of the natural populations, which, it is further pointed out, consist of a mixture of forms, some of which give their maximum hay yield at the first cut, some at the third, some at the sixth and so on.

Hybrid seed was produced by planting 10–12 seeds, belonging to different chosen varieties, in one hole and allowing them to interpollinate freely. By two successive interpollinations of Fergana lucerne with Peruvian lucerne in this way the yield of the former was raised by 18·4%, from 347·2 c. to 413·5 c. per ha. In single pollinations of Horezm lucerne with Taškent 721 an increase of 22·6% was registered and in pollinations of Fergana lucerne with a group of early-maturing varieties 14·3%. The root system was also better developed in plants derived from cross pollination and they were less severely attacked by leaf spot, rust, *Cercospora* and mildew and many of the hybrids produced in this way have now been released for cultivation. The best results were obtained when medium-early varieties were chosen as seed parents and early varieties with a short photostage in vernalization as pollen parent; in the reciprocal crosses, or in crosses between two varieties of similar phasic type, no effect was observed.

The improvements resulting from hybridization were maintained in the second and possibly also in later generations.

1968 CHRISTIDIS [KHRISTIDIS], B. G. **(Regional variety trials with cotton. Results in 1954).** Epistem. Delt. Inst. Bambak., Sindos 1955 : No. 3 : Pp. 60. [Greek].

Trials of Greek and American varieties throughout Greece in 1954 are reported. The characters studied were cotton yield, earliness and fibre quality.

1969 **(Long-fibred cottons in China).** Hlopkovodstvo (Cott.-raising) 1956 : No. 12 : p. 58. [Russian].

Mention is made of new high-yielding long-fibred varieties bred in eastern China.

1970 **Thirty-fourth Annual Report of the Indian Central Cotton Committee 1955** : Pp. 128.

Genetics

Genetical and statistical investigations and breeding at the Institute of Plant Industry, Indore, Madhya Bharat, have already been referred to in *PBA*, XXVI, Abst. 2616.

Bombay

In work on the production of improved *G. arboreum* for the Khandesh tract, two strains, Y–1 (Virnar x Dokras) and 29–7–6, showing promise of superiority over Virnar in both yield and quality, have been developed. Selections of Dhulia–2 and [(an introduction from Madras x Virnar) x a selection of Dhulia–2], together with 29–7–6, displayed a high degree of wilt resistance.

Progress is reported in breeding to improve the wilt resistance of 2087, a strain grown in the Surat area.

In the Broach tract the wilt-resistant variety Digvijay [98–41 (Vijay x 1027ALF)] has been released as an improvement over Vijay (cf. *PBA*, XXVI, Abst. 1462).

Hybrid selections superior to Kalyan in yield, quality and earliness are being developed for North Gujerat.

In the scheme on Mathio cotton, CJ73 (C520 x Jarila) maintained its superiority over Pratap in yield and fibre quality in further large-scale trials.

Search for a more satisfactory type than Laxmi for the Dharwar-American tract continued.

Among the *G. hirsutum-barbadense* hybrids studied in the breeding project on perennial cottons at Dharwar, the F_1's of (Quebradinho x V135) x Co.4–B–40 and Co.4–B–40 x Quebradinho showed promise. F_1 and F_2 material from crosses of the drought-resistant variety Jahagirdar with the black-arm-resistant types 2196BK, BC134–CW x AB5, 125–Co.2–18 and 170–Co.2 and Jinja was promising in the first ratoon with respect to economic characters but susceptible to diseases and pests. Some F_1 crosses between Asiatic annual and perennial cottons exhibited useful combinations of economic characters.

Progress was made in the recently initiated scheme of breeding black-arm-resistant American cotton at Dharwar. Subselections 170–Co.2–22 and 125–Co.2–18–2 combined good economic characters with a high degree of resistance; they have been crossed with Laxmi to improve its quality.

In the scheme for the improvement of Kumpta cotton in Bombay-Karnatak, two progenies of KFT x S8 have consistently maintained superiority over Jayadhar in all economic characters. Trials of the long-stapled Asiatic-American strains 170–Co.2, 134–Co.2–M and 68 x 22 continued. These are the first strains of commercial standard to result from the scheme of interspecific hybridization at Surat. Subselections of these strains show still further improvements in staple length and other characters. Work at Surat on the exploitation of hybrid vigour as a means of obtaining improved cottons with extra long staple has resulted in two hybrids, BC22 x Mocó and BC68 x Sea Island, with greater vigour, more satisfactory boll opening and a lower number of motes than Co.2 x Sea Island.

Punjab

A reselection (H14) of the American cotton 216F, superior to the parent variety in earliness, jassid resistance, yield and ginning percentage, was released for the south-eastern districts. In work on local cotton, selections with improved halo length have been obtained from crosses of the short-stapled 231 Rosea with long-linted types of *G. arboreum.*

In the project of breeding American cotton with a staple length of 1 in. or more, the strains LL43, 53, 54 and 60 are considered to be sufficiently promising to merit tests on cultivators' fields.

Four strains of American cotton, J2, J34, 39F and AC54, show promise of being suitable for the central and submontane districts.

Madras

Strain 9030, the result of the scheme of improving *G. hirsutum* as a winter crop in the central districts, has exhibited superiority over the control MCU–1 in yield, ginning percentage and fibre length. Reselection 9030–1 has longer staple and greater fineness than MCU–1. Progress was also made in two other schemes for breeding *G. hirsutum.*

In the project of developing longer-stapled Tinnevelly and Karunganni cottons in the central and southern districts, 6186 proved to be the best as regards adaptability and quality among the new strains tested under commercial conditions (cf. *PBA*, XXVI, Abst. 1462).

Andhra

In the scheme for developing a white-linted *G. arboreum* cotton for the Northerns tract, tests of strains showing improvements over N14 in lint characters continued.

Further progress was made in the development of strains superior in quality and other characters to 881F in the Mungari tract.

Breeding at Nandyal to improve Cambodia cotton has resulted in selections superior to Laxmi and N14 in halo length and other respects.

Madhya Pradesh

Progress is reported in the recently initiated projects of developing better strains of local and American types (cf. *loc. cit.*).

Uttar Pradesh

The release of a reselection of M4 as a substitute for the Punjab-American variety 216F in the central districts is expected.

Assam

Work on the development of high-yielding types of coarse short-stapled cotton continued.

Pepsu

In tests of American varieties, 320F again proved to be the best in yield and insect resistance.

Hyderabad

The strain 2204 maintained its promise as an improvement over the parent variety Gaorani12 in the Parbhani district (cf. *loc. cit.*). The strains 4166 and 5018 combined superiority in yield over 2204 and a high degree of wilt resistance. In trials in the Aurangabad and Bhir regions, selection 3591 of Gaorani 12 exceeded the parent variety in yield and ginning percentage and equalled it in spinning performance, besides being fairly resistant to wilt under field conditions.

Mysore

High-yielding families derived from crosses of MAV with *G. hirsutum* varieties having extra long staple were superior to MAV and MCU–1 in fibre length.

The Cambodia type 2196–4 gave an encouraging performance with respect to yield, ginning percentage, halo length and black-arm resistance in the Bellary district; it now requires tests on cultivators' holdings.

Selections of Westerns showing improvements in ginning outturn and other properties have been produced.

Rajasthan

Some of the American strains tested in Mewar were superior to the control Indore-1 in various aspects. Among the Old World cottons subjected to trial, 35/1 surpassed the local type in yield, ginning percentage and several other characters.

Madhya Bharat

Investigations at the Institute of Plant Industry, Indore, have been referred to above under *Genetics*.

D48–154, a promising strain for the Nimar tract, has been named Maljari (cf. *loc. cit.*).

Orissa

A scheme with the following aims has been initiated: (1) a botanical survey of cotton in the state and (2) acclimatization of American and other varieties in connexion with the Hirakud Dam Project.

1971 BEDERKER, V. K.
Further improvement of Hyderabad Gaorani cotton.
Indian Cott. Gr. Rev. 1956 : **10** : 157–67.

The further improvement of Gaorani cotton since 1949, by means of single-plant selection, is described. Selection has been concentrated upon improvements in yield, fibre length, ginning percentage, boll size and wilt resistance. Four strains, 688, 1422, 1494 and 1585, are undergoing tests prior to the choice of one of them as a substitute for Gaorani 6. They are superior to the last-mentioned variety in fibre length, ginning percentage and boll size, and equal or superior to it in yield.

1972 GOODMAN, A.
The Tokar investigation.
Emp. Cott. Gr. Rev. 1956 : **33** : 300–06.

Data are provided on the total nodes, number of nodes shed and small and large bolls produced by six varieties grown at Tokar. Environmental conditions at this locality reduced the fruiting of X1730A, Domains Sakel and BRL14/25 almost to nil, although these varieties made more vegetative growth than Coker Wilds 11, NT96/40 and BAR12/9, which gave small crops.

1973 SELF, F. W., HENDRIX, J. A., OAKES, J. Y., JOHNS, D. M. & WOODWARD, R. S.
Cotton variety tests in Louisiana, 1951-55.
Bull. La. agric. Exp. Sta. 1956 : No. 504 : Pp. 23.

The results of trials of varieties with respect to yield and other characters in different regions in Louisiana are summarized. The new variety Stardel surpassed Deltapine 15, Fox and Delfos 0169 in yield and strength (cf. Abst. 701).

1974 BHAT, N. R. & PATEL, C. T.
A study of the occurrence of 'drooping', 'leaning' and 'creeping' segregates in some interspecific crosses of Gossypium.
Indian Cott. Gr. Rev. 1956 : **10** : 173–76.

Segregates described as drooping, leaning and creeping have been observed among interspecific hybrids, particularly those involving *G. anomalum*, at the Agricultural Research Station, Surat, Bombay State. It is postulated that the abnormalities are in general due to a dominant gene which is hypostatic to another gene, and that the genes are carried by different chromosomes in the genome B of *G. anomalum*, these chromosomes having homologues in the A genome of the diploid and amphidiploid cultivated species. Morphological disparities between the three abnormal types are ascribed to the varying expression of the hypostatic dominant gene in different genotypes. Unlike the other crosses, the F_2 of Co.2 (*G. hirsutum*) x Sea Island (*G. barbadense*) did not contain any abnormal types, but one F_3 progeny segregated according to a bifactorial ratio for normal and drooping plants. A mutation of the recessive gene for normal habit to the dominant condition responsible for drooping may therefore have occurred in an F_2 plant which was heterozygous for the epistatic gene.

1975 VYSOCKIĬ, K.
(Distant hybridization within the family Malvaceae).
Hlopkovodstvo (Cott.-raising) 1956 : No. 12 : 28–35. [Russian].

Intergeneric sexual hybrids of *Gossypium hirsutum* with different species of *Malva*, *Hibiscus* and other Malvaceae are reported from the Central Asiatic Branch of the Institute of Plant Industry. The sterility of the F_1 was in most cases overcome by back crossing to cotton or the other parental species.

Among the results of the above work are the varieties Krupnokorobočnyĭ [Large-bolled], Skorospelyĭ [Early] and Kompaktnyĭ [Compact] which outyield the standard 108F, ripen earlier and are superior technologically. Krupnokorobočnyĭ produces bolls weighing 11·3 g. as against 7·0 g. in the standard.

1976 MANNING, H. L.
Yield improvement from a selection index technique with cotton.
Heredity 1956 : **10** : 303–22.

A genetic advance of the order of 35% was recorded at stations of the Empire Cotton Growing Corporation, in Uganda, after six generations of selection in BP52 upland cotton, using a selection index technique based on the primary components of yield, bolls per plant, seeds per boll and lint per seed. It is concluded that considerable genetic variability must have been present in the original self-fertilized material, and that continued selection within inbred material is therefore justified. The improvement in the modal bulk check standard suggests that natural selection favours the breeder whenever the number of seeds produced is intimately related to yield. (Cf. Abst. 1067).

1977 Green, J. M. & Oswalt, E. S.
Parrott, a new cotton variety for Oklahoma.
Bull. Okla. agric. Exp. Sta. 1956 : No. B.478 : Pp. 15.

A detailed account is given of the above variety, already referred to in *PBA*, XXV, Abst. 3222.

1978 Mercado Mesa, O.
Autogamia y efecto de los insecticidas en la fertilidad del algodón Tangüis. (**Self fertilization and the effect of insecticides on the fertility of Tangüis cotton**).
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 346 : 30–36. (Mimeographed).

No significant reduction in set was observed after bagging the flowers and it is concluded that fertilization in Tangüis cotton is independent of the action of insects. Treatment with aldrin, lead arsenate and other insecticides increased the amount of boll shedding but had no effect on the actual process of fertilization.

1979 Ter-Avanesjan, D. V. & Gausman, I. V.
(**Biological importance of cotyledonous leaves for ontogenesis of the cotton plant**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **109** : 1045–48. [Russian].

At the Institute of Plant Industry, plants of *Gossypium hirsutum*, *G. barbadense*, *G. arboreum* and *G. herbaceum* were induced to form adventitious buds from the cotyledons. These were then rooted and separated from the rest of the plant. The plants derived from the cotyledons are referred to as "cotyledonous"; the rest of the embryo was allowed to develop and the resulting plants are termed "embryonic". Both cotyledonous and embryonic plants showed greater variability than the controls with regard to morphological and economic characters such as fibre length and raw cotton yield per plant. The observed changes were heritable. The seed progeny of the cotyledonous plants were said, in general, to manifest heterosis while that of the embryonic plants showed decreased vigour in the F_1 generation but showed improvement in this respect in the F_2. Some F_2 plants had economic characters greatly superior to the initial forms and are regarded as valuable breeding material.

1980 Ramaswami, V. & Sivasubramaniam, V.
A note on the production of extra long staple cotton in the Madras State.
Indian Cott. Gr. Rev. 1956 : **10** : p. 201.

Although superior to Madras Uganda 1 in yield, ginning percentage, fibre length, lint fineness and spinning value, the newer strain Madras Uganda 2 does not equal imported East African cotton in fibre length. Hybrid material offering promise of the successful development of a high-yielding strain equal in quality to the imported cotton has now been obtained.

1981 Abdul Hameed Khan
Oil content of cottonseeds.
Agriculture, Pakistan 1956 : **7** : 128–39.

Data are provided on the oil content of the seed of (1) commercial varieties used in the Punjab, (2) reselections of LSS and (3) new strains. Those with the highest oil content are (1) 4–F, LSS and 199–F, (2) 424–F and 319–F and (3) 244–F, L2, 419–F, Ac.–134 and Ac.–158, all of this group exceeding LSS. Additional data are provided on the yield, ginning outturn, staple length and oil content of some LSS reselections for the year 1953–4, showing that many of the reselections tested had higher ginning outturn and oil content than LSS. The development of varieties combining high oil content with other desirable characters is continuing.

1982 Minko, D.
(**The development of Soviet cotton varieties with the properties of fine-fibred cotton**).
Hlopkovodstvo (Cott.-raising) 1956 : No. 11 : 47–51. [Russian].

An account of multiple hybridization involving the hybrid 7631I of *Gossypium hirsutum* x *G. barbadense* at the USSR Cotton Institute is given. First the hybrid was crossed with hybrid lines such as 1149, which had been selected for strong fibre and other good technological properties. The progenies showed variability with regard to most economically important characteristics, but uniform material, notably line 76319, was obtained by selecting the best families in the F_3 and by intercrossing these for several generations. Line 76319 is as productive as 108F, although its raw cotton yield before the onset of frosts is slightly lower. It has a high ginning percentage, good length and strength of fibre, a large boll and the same technological properties as the fine-fibred variety 10964. Work on the improvement of 76319, aiming mainly at greater earliness, is in progress. The methods include continuous selection and hybridization with line 141, continued intercrossing between the line 76319 and selected families of 76311 x 1149 and the use of mixed pollen of the fine-fibred varieties 2282 + 1145.

1983 GREEN, J. M. & BRINKERHOFF, L. A.
Inheritance of three genes for bacterial blight resistance in upland cotton.
Agron. J. 1956 : **48** : 481–85.

Data from crosses involving Stoneville 20 suggest that resistance in this variety is controlled by a major recessive gene designated b_7, deviations from the expected segregation ratios being attributed to the action of other genes with smaller individual effects. The three lines 1–10–B–4–B, 20–8–1–3–1 (derived from Northern Star) and 6–77–5–8 (derived from Stormproof 1) each appeared to carry a dominant gene for resistance, for which the respective symbols B_I, B_N and B_S are proposed. There was evidence that B_N and B_S are allelic or closely linked.

1984 SIMLOTE, K. M. & MERH, J. L.
Study of cotton wilt and breeding of resistant strains for Malwa.
Indian Cott. Gr. Rev. 1956 : **10** : 168–72.

Breeding for resistance to *Fusarium vasinfectum* at the Institute of Plant Industry, Indore, Madhya Bharat, is reviewed. Selection is now carried out by testing seedlings under glasshouse conditions and then subjecting the survivors to infection in the field, this process being repeated each season. Tested in this way several Malvi strains have shown a high degree of field resistance.

1985 **New Arizona cotton resists wilt disease.**
What's New Crops Soils 1956 : **9** : No. **3** : p. 21.

Promising results have been obtained in tests in Arizona with a new variety, 44–WR, resistant to *Verticillium albo-atrum*. On wilt-infected soil it outyielded 4–42–WR by 1 to 23% but its yarn strength was slightly less and its nep count 36·7% less than that of 4–42–WR.

1986 FRIEDERICH, J. C.
De resultaten van de vezelvlasrassenproeven gedurende 3 jaren van West-Europese samenwerking. **(The results of fibre-flax variety trials during three years of West European co-operation).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **13** : 88–89.

The results of 69 trials in 10 different countries are summarized. The best results were obtained from Wiera, followed by Madonna, Diana and Solido. Swedish varieties tended to mature too late and English and Irish varieties proved susceptible to lodging and diseases.

1987 ROGAŠ, A. R.
(Using vegetative hybridization in flax breeding).
Agrobiologija (Agrobiology) 1956 : No. **3** : 89–94. [Russian].

Some new flax varieties, obtained by vegetative hybridization at the Flax Institute in Toržok, are characterized by tall habit, improved seed and fibre yields and good length and quality of fibre. Some vegetative hybrids, in particular of Tekstiljščik [Textile Worker]/*Linum perenne* are more productive of seed and fibre than the standard I7 and show resistance to *Melampsora*, *Fusarium* and anthracnose. Resistance to diseases was acquired by the vegetative hybrids in the later seed generations and was further improved by selection of resistant types among artificially infected material.

1988 KHANNA, A. N. & SINGH, K. B.
Behaviour of pollen-tube growth in some interspecific crosses in the genus *Linum*.
Agra Univ. J. Res. 1956 : **5** : 169–78.

Crosses and reciprocal crosses have been made between *L. usitatissimum* ($n = 15$) and *L. grandiflorum* ($n = 8$), *L. marginale* ($n = 15$), *L. angustifolium* ($n = 15$) and *L. africanum* ($n = 16$) and the development of the pollen tube observed after 12, 24, 48 and 72 hours. Normal pollen tube development was observed in all cases except *L. grandiflorum* x *L. usitatissimum* and *L. africanum* x *L. usitatissimum*, in which pollen germination was poor, swelling and bursting of pollen tubes occurred and no pollen tubes grew below the middle of the style even after 72 hours. A connexion is suggested between the failure of pollen-tube growth in these crosses and the upsetting of the normal 2 : 1 chromosome-number relationship of the style and pollen tube.

1989 **Seed bulletin. Fibre flax.**
IVRO, Wageningen 1956 : Pp. 7.

Varietal descriptions and technical data are presented for the more important varieties of fibre flax grown in the Netherlands.

1990 FRIEDERICH, J. C.
Het huidige vezelvlasrassensortiment in Nederland, gebaseerd op de resultaten uit de jaren 1954 en 1955. (**The present fibre-flax variety collection in the Netherlands, based on the results of the years 1954 and 1955**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **13** : p. 47.

Of the fibre-flax varieties grown in the Netherlands, Wiera (cf. *PBA*, XXIII, Abst. 167) and Solido are the most reliable as regards yield and are also the most resistant to diseases and lodging. Other important varieties, of which descriptions are given, include Diana, Madonna and Regenboog [Rainbow].

1991 DIRKS, V. A., ROSS, J. G. & HARPSTEAD, D. D.
Colchicine-induced true-breeding chimeral sectors in flax.
J. Hered. 1956 : **47** : 229–33.

Colchicine treatment of the epicotyl of an F_1 seedling from a cross between Crystal, which is yellow-seeded, white-flowered and wilt-resistant and carries the *L* factor for rust resistance, and B–5128, which is brown-seeded, blue-flowered and moderately wilt-resistant and has the N^4 gene for rust resistance, gave rise to two true-breeding sectors resembling the respective parents in the above characters, except that the yellow-seeded sector proved much less wilt-resistant than the brown. The diploid chromosome number was found in all sectors. Anomalous segregation ratios in other treated plants suggested that these also contained homozygous sectors. It is postulated that the true-breeding sectors have arisen as a result of somatic reduction division with subsequent doubling. Evidence that gene mutation had occurred in some plants as a result of colchicine treatment was also obtained.

1992 FLOR, H. H.
Mutations in flax rust induced by ultraviolet radiation.
Science 1956 : **124** : 888–89.

As the author has already reported, a gene-for-gene relationship exists between reaction to rust (*Melampsora lini*) in flax and virulence of the pathogen, the ability of a race to attack a flax variety being recessive and host resistance dominant (cf. *PBA*, XXV, Abst. 1256 and XXVI, Abst. 2640). Ultraviolet treatment of uredospores of an F_1 culture of race 22 x race 1, which was heterozygous for pathogenicity and avirulent on a number of differentials, induced mutants able to attack six of the varieties resistant to the control uredospores. These differentials comprised Dakota, Cass, Polk, Birio, Wilden and Barnes. The mutants attacking Dakota, Cass and Polk differed from the control hybrid culture only in the ability to attack one of these varieties; a mutation of a single gene had therefore occurred in each case. Although no mutant was isolated by culturing upon Birio, mutants pathogenic on Barnes and Wilden attacked this flax. Possibly the genes conditioning pathogenicity on these three varieties are so closely linked that a single hit simultaneously altered all three genes.

1993 RAGAZZI, G.
Il miglioramento genetico della canapa. (**The genetic improvement of hemp**).
Coltiv. e G. vinicol. ital. 1953 : **99** : 396–400.

A brief review is given of recent Italian work on hemp breeding and of the methods proposed for the future.

1994 ERDELSKÝ, K. & HERICH, R.
Príspevok k biochemickej diferenciácii pohlavia konopí (*Cannabis sativa* L.) II. [**A study of biochemical differentiation of sex in hemp (*C. sativa* L.) II**].
Biológia, Bratislava 1956 : **11** : 111–15.

The differences in N, K and P content in the root and above-ground portions of the plants of hemp plants bearing ♀, ♂ or intersexual flowers are noted and discussed in relation to sex differentiation.

1995 HERICH, R.
K problému diferenciácie pohlavia rastlín. (**The problem of sex differentiation in plants**).
Biológia, Bratislava 1956 : **11** : 220–24.

By soaking the seed of the hemp variety Polyploidná [Polyploid] in solutions of $MnSO_4$, KBr, KI or H_2O_2 the percentage of ♀ flowers was reduced and that of ♂ or intersexual flowers increased. In the variety Šumperská also a reduction in the number of plants with ♀ flowers and an increase of those with ♂ flowers was observed.

1996 HESLOP-HARRISON, J.
Auxin and sexuality in *Cannabis sativa*.
Physiol. Plant. 1956 : **9** : 588–97.

In experiments on the diecious species *C. sativa*, all the flowers appearing shortly after a period of photoperiodic induction followed by application of α-naphthaleneacetic acid were female, both in plants which upon further photoperiodic induction without auxin treatment produced male flowers only and in those which proved to be female. Compared with plants untreated with auxin, the treated individuals also showed a reduction in the intensity of the flowering response and a modification of the changes in leaf shape which accompany flowering.

1997 KUNDU, B. C.
Jute — world's foremost bast fibre. I. Botany, agronomy, diseases and pests. II. Technology, marketing, production and utilization.
Econ. Bot. 1956 : **10** : 103–33; 203–40.

The section on botanical aspects includes a survey of work carried out on the cytology, genetics and breeding of jute in the subcontinent of India before and since partition.

1998 JOYNER, J. F. & PATE, J. B.
The inheritance of leaf shape in kenaf.
J. Hered. 1956 : **47** : 199, 204.

The results of crosses among two lines with deeply lobed leaves and two with leaves with shallow lobes indicated that the deeply lobed character was dominant and monogenically determined.

1999 NARITA, Y. & YOSINAGA, K.
(**Studies on the breeding of *Broussonetia*. III. On the chromosome number of *B. Kaempferi* Sieb.**).
J. Jap. For. Soc. 1955 : **37** : p. 52. [Japanese].

The above species has $2n = 26$ chromosomes (cf. *PBA*, XXV, Abst. 3259).

2000 HÅKANSSON, A.
Chromosome number and meiosis in *Salix* (*grandifolia* x *gracilistyla*) x *S.* (*silesiaca* x *aegyptiaca*).
Hereditas, Lund 1956 : **42** : 519–20.

Six hybrids from the cross between the diploid ♀ parent *S. grandifolia* x *S. gracilistyla* and triploid ♂ parent *S. silesiaca* x *S. aegyptiaca* proved to be tetraploids ($2n = 76$), presumably as the result of fertilization by unreduced ♂ gametes. Meiosis was fairly regular.

2001 KIMURA, A.
Symbolae iteologicae IX. (**Contributions on willows IX**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1946 : **59** : 79–90.

These taxonomic notes include descriptions of the following new Japanese species and hybrids: *Salix ohsidare*, *S. euerata* (*S. gilgiana* x *S. sachalinensis*), *S. hapala* (*S. gilgiana* x *S. integra*) and *S. yoitiana* (?*S. gracilistyla* x *S. hultenii*).

SUGAR AND STARCH PLANTS

Proceedings of the Eighth Congress of the International Society of Sugarcane Technologists, British West Indies, 13th April-3rd May 1953
(1954) : Pp. 996.

2002 *Sornay, A. de. Use of calculator for rapidly recording plot yields.* (*pp.* 309–10).

The author describes the use of a small hand "addiator calculator" for recording cane yields of plots in variety trials at the Mauritius Sugarcane Research Station.

2003 *Paliatseas, E., Steib, R. J., Dunckelman, P. H. & Chilton, S. J. P. The production of true seed of sugarcane in Louisiana.* (*pp. 361–64*).

Breeding in Louisiana is at present based on seed obtained from hybridization at Canal Point, Fla. Success has however been achieved in selfing and crossing under greenhouse conditions on Grand Isle near the Louisiana coast.

2004 *Paliatseas, E. & Chilton, S. J. P. Some observations on the effect of temperature on the production of pollen by certain varieties of sugarcane in Louisiana.* (*pp. 364–66*).

Fourteen of the 17 varieties studied produced viable pollen in the greenhouse on Grand Isle, La., the minimum temperature being 75° F.

2005 *Gonzalez Rios, P. The use of a sprayer in the pollination of sugarcane.* (*pp. 366–71*).

Details are given of a simple and rapid method of collecting pollen from arrows maintained in sulphurous-phosphoric acid solution in the greenhouse and applying the pollen to the ♀ arrows in the field by spraying. The technique is recommended for use in any locality with prolonged rainfall during the breeding season, such as occurs at the Río Piedras Agricultural Experiment Station, Puerto Rico, where the method was devised.

2006 *Vijayasaradhy, N. & Narasimhan, R. Control of flowering in sugarcane.* (*pp. 371–401*).

An account is given of investigations on the following varieties at the Sugarcane Breeding Institute, Coimbatore, Madras: the early-flowering canes Co. 285 and Co. 421, the late-flowering varieties Co. 290 and Uba Marot, and two nonflowering representatives of *Saccharum* *spontaneum* (Assam 301 and a form from Burma). Normal day length was required for normal flowering. In both early and late varieties, long or short days applied before initiation of the flower primordia, at the time of initiation of these primordia and after their initiation inhibited, delayed and had no marked effect upon flowering, respectively. Varietal differences in response to photoperiodic treatment were however marked. Daily irrigation, as opposed to irrigation once in 10 days, prolonged the duration of flowering in both early and late canes. The effect of manurial treatments upon flowering was not important. Flowering was induced in the two nonflowering canes by various treatments but their behaviour during different years was inconsistent. The actual initiation of the flower primordia occurred during the same period (end of August) in both late and early varieties. Under natural conditions at Coimbatore, arrowing coincides with the period of short days. Possibly because of this behaviour some investigators may have concluded that sugar cane is a short-day plant.

2007 *Dutt, N. L., Thuljaram Rao, J. & Hussainy, S. A. On certain recent aspects of the breeding programme at Coimbatore. (pp. 402–10).*

Mostly with reference to previously published work, the authors discuss parental stocks and review progress so far achieved in breeding for earliness, nonpithiness, suitability as chewing canes, juice quality and resistance to red rot (*Colletotrichum falcatum*) and in determining the plant characters associated with resistance to the pests *Scirpophaga nivella*, *Diatraea* sp., *Paratetranychus indicus*, *Schizotetranychus andropogoni* and *Pyrilla perpusella*. Among the parental stocks discussed are *S. spontaneum*, Co. canes, *S. robustum* '28NG251' which has however produced seedlings poor in sucrose content and susceptible to lodging, sweet sorghum varieties from Africa and 4*n* sorghums from the USA. Canes of sorghum parentage are not wholly satisfactory as regards yield and sucrose content but three have been released for trial at research stations.

2008 *Warner, J. N. The philosophy of sugarcane breeding in Hawaii. (pp. 410–15).*

Breeding in Hawaii is carried out on an extensive rather than an intensive basis. Essential features of the programme are as follows: the use of each clone in a diversity of parental combinations and introduction of new germ plasm from other countries, large seedling populations, use of less severe forms of inbreeding within seedling populations, diversification of testing areas combined with a well-coordinated system of recording seedling performance, and successive interbreeding of selected individuals. The "melting-pot" technique of crossing cut canes preserved in sulphurous-phosphoric acid solution is used to obtain a large number of combinations between known ♀ parents and unknown males. In the field nurseries, a method of "bunch planting" is adopted in which the weaker seedlings are eliminated by natural selection.

2009 *Warner, J. N. Techniques of breeding and testing sugarcane in Hawaii. (pp. 415–22).*

Detailed information is given on the procedures used in (1) making the ordinary type of biparental cross and "melting-pot" and "area" crosses, (2) seedling propagation and (3) selection. In the area cross, combinations are effected between a large number of female parents and one known male parent, cut canes being maintained as in the melting-pot method

2010 *Gard, K. R. The aims of the sugarcane breeding programme at Macknade, Queensland, with special reference to sugar content, vigour and disease resistance. (pp. 423–29).*

Breeding carried out by the Colonial Sugar Refining Company at Macknade is described. From the point of view of the development of commercial varieties, Co. 270, POJ2878, POJ2364, POJ2875 and Trojan have been the best ♀ parents. These vigorous canes are all second or third generation nobilizations of *S. officinarum* x *S. spontaneum*. The following canes have proved to be best ♂ parents: 27MQ1124, 31MQ228, 33MQ157, 28MQ1370, 38MQ2644, M1900 Seedling and 33MQ371. With the exception of M1900 Seedling from Mauritius, these are all descendants of the noble canes Badila and Korpi. Two of them, 33MQ157 and 33MQ371, also carry *S. spontaneum* germ plasm inherited from POJ2878. These male parents, which have imparted the character of high sugar content, have all been inbred, with the exception of M1900 Seedling. High sugar content may therefore be a recessive character. It is suggested that, in general, collection of noble canes with high sugar content should be extended since such canes may decrease in abundance as the tendency to use interspecific hybrids as commercial varieties grows. Varieties highly resistant to gumming disease (*Xanthomonas vasculorum*), developed from *S. officinarum* x *S. spontaneum* crosses by the Company and Bureau of Sugar Experiment Stations in Queensland, have frequently proved susceptible to diseases to which the older varieties were resistant.

2011 *Arceneaux, G. Some neglected aspects of experimental procedure in making comparative tests of sugarcane varieties. (pp. 429–40).*

The author bases his discussion on experience gained in variety testing in Louisiana. He expresses the view that present-day concepts of experimental error and statistical significance reflect undue emphasis on experimental precision in relation to factors operating within individual experiments; the importance of sampling the effects of overriding variables such as variations in weather conditions and in insect injury to obtain a more reliable estimate of significance is emphasized. An analysis of trends in variety x year interaction over a period of time is illustrated and proposed as a means of measuring deterioration in varietal yield. The author also comments on the procedures of obtaining cane samples for comparative juice analyses from experimental plots of juice sampling, and of testing varietal milling qualities by the pilot-plant technique. A fractionating device is described by means of which the experimental error in analysing individual juice samples is significantly reduced, in comparison with the results obtained from juice sampled by dipping. Use of a generalized correction factor to compensate for varietal differences in milling qualities permits the calculation of unbiased values for yield of sugar per ton of cane from crusher juice analyses.

2012 *Dunckelman, P. H. & Steib, R. J. Some techniques used in the sugarcane breeding program at Baton Rouge, Louisiana. (pp. 441–43).*

Labour-saving methods of growing the seed, transplanting the seedlings in pots in the greenhouse and subsequently transplanting them in the field are described.

2013 *Grassl, C. O. & Belcher, B. A. Sugarcane breeding techniques practised at Canal Point, Florida. (pp. 443–51).*

The shortness of the flowering season in the above locality is counteracted by a system of arrangement of small breeding plots, rendering each plot and each cane within a single plot readily accessible, and also by special treatments of the breeding canes. Late-flowering canes are grown in sand to bring about earlier flowering, while early-flowering canes are raised on muck soil to delay flowering. Crosses between cut canes maintained in sulphurous-phosphoric acid solution are made under sheltered conditions to eliminate the effects of wind or in the greenhouse where pollen production is encouraged by higher night temperature. It is however noted that this preserving solution has given disappointing results in the greenhouse on account of the toxic accumulation of SO_2. Methods of rooting flowering stalks for use in crossing in the greenhouse and local problems involved in crossing ♀ parents *in situ* with cut ♂ canes are also discussed.

2014 *Inniss, B. de L. The methods and policy used in sugarcane breeding and selection at the B.W.I. Central Sugarcane Breeding Station and the results achieved to date. (pp. 452–62).*

The main features of the breeding programme are reviewed, short notes being given on the origin and characters of B3172, B3337 and other Barbados seedlings which have achieved, or show promise of attaining, commercial status.

2015 *Brett, P. G. C. A note on stimulation of rooting in detached sugarcane stalks by means of the proprietary fungicide "Aretan". (pp. 462–63).*

Addition of 0·002% aretan to the standard sulphurous-phosphoric acid solution used at the Experiment Station of the South African Sugar Association to preserve detached flowering shoots until rooting occurs has a stimulating effect upon root growth.

2016 *Brett, P. G. C. Temperature and ovule fertility of sugarcane in Natal. (pp. 463–65).*

Low temperatures in the field may adversely affect ♀ fertility, as well as production of viable pollen. Exposure to higher temperatures in the greenhouse increased ovule fertility in N : Co.154 and N : Co.310 which are normally rather infertile.

2017 *Grassl, C. O. A plea for carefulness in naming of sugarcane seedlings. (pp. 465–74).*

The author draws attention to sources of confusion in systems of assigning designations to seedlings and new commercial varieties and suggests ways in which this unsatisfactory situation may be improved. A table is given explaining abbreviations used for seedlings and varieties; another lists names combined with numbers (such as Aiea 165, Alabang 1 and Auerbach No. 21) and the country where they originated.

2018 *Raghavan, T. S. Some cytogenetical features and breeding behaviour of a* Saccharum spontaneum *derivative. (pp. 475–85).*

A general account of *S. spontaneum* in respect of its geographical distribution, role in breeding and cytogenetic behaviour is followed by information on the origin and characteristics of a form ($2n = 96$) of this species collected in Burma in 1929. One of the seedlings ($2n = 108$) obtained from an open-pollinated arrow of this form in 1933 was selected for its vigour and erect habit and designated Co. 745; the sucrose content of the seedling is however very low. Seedlings from crosses of Co. 745 as ♀ with Co. 285 [(*S. officinarum* 'Green Sport' x *S. spontaneum* from Coimbatore), $2n = 112$], a cane with juice properties up to commercial standard, contain more sugar than Co. 745 but a high amount of fibre. The seedlings show a preponderantly maternal inheritance of vigour, habit and morphological features. One of the seedlings contains more sucrose than Co. 285 and has a comparatively low percentage of fibre. Further crossing of this and other seedlings with suitable Co. canes is expected to result in a further increase in sucrose content and further reduction in fibre percentage. Seedlings of Co. 285 x Co. 745 and the reciprocal have $2n = 110$, indicating that reduced gametes functioned. Male sterility among the hybrids is expressed as a maternally inherited character derived from Co. 745. Cytogenetical evidence is presented suggesting that Co. 745 arose as a selfed derivative of the Burmese introduction.

2019 *Buzacott, J. H. The parental performance of some sugarcane varieties in Queensland. (pp. 485–91).*

In breeding by the Bureau of Sugar Experiment Stations, Co. 290 has proved to be the most valuable parent for the production of commercial canes, particularly in crosses with POJ2878 and POJ2725. Ratoon stunting disease may be a cause of the marked deterioration affecting selections from certain crosses, e.g. Trojan x Eros and Q27 x Badila. Brief notes on the chief canes whose good performance as parents is proven are provided. Under the agricultural and climatic conditions of Queensland, noble and near-noble canes are likely to remain the chief varieties grown for several years to come.

2020 *Panje, R. R. Studies in* Saccharum spontaneum *and allied grasses. 3. Recent exploration for* Saccharum spontaneum *and related grasses in India. (pp. 491–504).*

The author describes the characteristics of the ten main ecological tracts distinguished in the Indian subcontinent, and types of *S. spontaneum* and species of *Erianthus*, *Narenga* and *Sclerostachya* found in the different regions. The largest number of types of *S. spontaneum* and species of the other three genera occurs in the Terai region comprising the submontane belt of the Himalayas and submontane areas of Assam.

2021 *Li, H. W., Ma, T. H. & Shang, K. C. Cytological studies of sugarcane and its relatives. (pp. 504–08).*

In investigations at the Taiwan Sugar Experiment Station, the F_1 progeny of the cross of the sugar-cane seedling 36–423 ($2n = 127$) as ♀ with *Miscanthus japonicus* ($2n = 38$) had chromosome numbers ranging from 100 to 114, and resembled the ♂ parent in appearance. All the hybrids therefore appeared to belong to the OMM type, resulting from combinations of reduced ♀ gametes and unreduced ♂ gametes. Possibly the tassel of the *Miscanthus* parent used for pollination was tetraploid.

2022 *Stevenson, G. C. The use of selfing and inbreeding with sugarcane. (pp. 509–21).*

With reference to the literature and work at the BWI Central Sugar Cane Breeding Station, Barbados, the author illustrates the potentialities of selfs and the production of pure lines. These potentialities are enhanced by the widespread use of interspecific hybrids which are likely to show less loss of vigour upon selfing than noble canes. Experiments in Barbados have in fact indicated that loss of vigour does not necessarily occur in first-generation selfs of interspecific aneuploids and that selfed populations may give high selection percentages. Progress in the development of pure lines for recombination depends upon meiotic behaviour. Loss of univalents derived from *S. spontaneum* and autosyndetic pairing among a proportion of the *S. spontaneum* chromosomes would result in the development of pure lines, from the same original hybrid, representing different degrees of nobilization. The author gives examples of the successful use of selfs as commercial varieties and as breeding canes in Barbados and Australia and discusses the pedigrees of some POJ and other canes which are the result of mild forms of inbreeding.

2023 *Buzacott, J. H. & Hughes, C. G. Cane collecting in New Guinea in* 1951. (*pp. 521–32*).

The writers describe the itinerary of the expedition of the Queensland Bureau of Sugar Experiment Stations, the collections obtained and the diseases and insect pests recorded as attacking *Saccharum* in New Guinea. The chief aim was the collection of nonnoble canes in the central highlands but some collecting was also done in the coastal areas. The clones collected included 136 noble or near-noble varieties, 19 representatives of *S. robustum*, 4 of *S. spontaneum* and 3 of *Miscanthus floridulus* (cf. *PBA*, XXII, Abst. 1296). The following two canes are among those regarded as being of particular interest: *S. robustum* '51NG91', with very large stalks, heavy foliage and a relatively high Brix value for the species; and the chewing cane 51NG89, probably a hybrid of *S. officinarum* x *S. robustum*, with a Brix reading of 23.

2024 *Chen, C.-F. Genetical analysis of morphological characters of the OMM-type hybrid obtained from the P.O.J. 2725 x* Miscanthus japonicus *cross.* (*pp. 533–46*).

Obtained at the Taiwan Sugar Experiment Station, seedling 36–771 ($2n = 96$) from POJ3725 ♀ ($2n = 107$) x *M. japonicus* ($2n = 38$) is regarded as a hybrid of the OMM type. The seedling closely resembles *M. japonicus* externally. The morphological characters studied could be classified into four groups, showing (1) complete dominance of genes from POJ2725, (2) complete dominance of genes from *M. japonicus*, (3) dosage effect and (4) no definite trend of inheritance. The Brix value of the hybrid was 15·4 as compared with 21·8 for POJ2725. Theoretically, two types of hybrids may be obtained from the first back cross, viz. $00\frac{0}{2}\mathrm{M}$ and $0\frac{0}{2}\mathrm{M}$, but the former type, which is more desirable for further back crossing to improve sugar content, has occurred only very rarely.

2025 *Davison, B. K., Thomson, A. F., Wiggins, L. F. & Yearwood, R. D. E. Sugarcane wax. Part IV. Some observations on the effect of burning cane, of cane variety and of mud storage on wax yields.* (*pp. 663–70*).

Of the six Barbados varieties tested, B37161 gave the highest yields of crude wax and hard wax in the filter mud. B4098 was a fairly good producer of wax. The remaining canes, B34104, B41227, B41211 and B37172, gave only mediocre yields.

2026 *King, N. J. & Steindl, D. R. L. The relationship between varietal yield deterioration and ratoon stunting disease.* (*pp. 851–62*).

The authors give the evidence upon which they have based their conclusion that the deterioration in yield affecting many varieties in Queensland is closely associated with ratoon-stunting disease, believed to be due to a virus.

2027 *Hutchinson, P. B. & Robertson, J. R. Leaf scald in British Guiana.* (*pp. 877–84*).

The paper includes information on methods used in British Guiana in evaluating varieties for resistance to leaf scald (*Xanthomonas albilineans*). At present the only resistant commercial variety available in this colony is B4098, which at present occupies only 1·3% of the sugar-cane acreage and which is highly susceptible to moth borer. B41227 and B37161 have however largely replaced B34104 and D14/34, and are at least less susceptible than these two canes.

2028 *Abbott, E. V. Tolerance to dilution and heat of six strains of the sugarcane mosaic virus.* (*pp. 911–14*).

Strains of mosaic differing in symptom expression on sugar-cane differentials may also show disparities in tolerance of dilution and heat. Determination of end points of tolerance may be of value in separating strains showing similarities in the expression of symptoms.

2029 *Bourne, B. A. Studies on sugarcane red rot in the Florida Everglades.* (*pp. 915–24*).

The important commercial variety F31–436 has only shown noticeable damage from red rot either when heavily attacked by moth borer or when severe hurricanes or flood rains occur during susceptible stages of vegetative growth. In the above region, the light strain of *Colletotrichum falcatum* and white and purple strains of *Fusarium moniliforme* are responsible for red rot. The results of inoculation tests of a number of varieties with *C. falcatum* and the purple strain of *F. moniliforme* are given.

2030 *Wismer, C. A. Stem gall development of sugarcane, variety 44–3098, following insufficient soil moisture.* (*pp. 945–51*).

Stem galls were induced on the internodes of 44–3098 as the result of inadequate water supply. Stalk mites were not found on the galled canes. This variety is more sensitive to stem-gall development than other commercial varieties in Hawaii, with the exception of 39–3633.

2031 OBAIDULLAH JAN, M.
A brief summary of the results of research on sugarcane during the last ten years.
Agriculture, Pakistan 1956 : **7** : 83–85.
The progress made in developing new varieties suitable for conditions in the North West Frontier Province is reviewed.

2032 **Annual Report of the Experiment Station of the South African Sugar Association 1955-56** : Pp. 38.
The methods used during 1955–56 in making new crosses are described; it is estimated that 60,000 seedlings were produced. Of lines now at the later stages of selection only N10 (NCo.310 x Co.301) gave better yields than NCo.310 as a first ratoon crop, but as 24-month-old plant cane both N50–125 (NCo.310 x Co.331) and N50–211 (POJ2725 x Co.285) gave higher yields of sucrose per acre. Data are provided on the yields at three localities of 15 varieties in the third NCo. series. NCo.376 yielded well on all soil types and NCo.382 was also promising.
Two mosaic-resistance trials, planted in 1949 and 1950, have been harvested for the last time and the following conclusions are drawn: NCo.310 shows a high rate of recovery from infection, Co.331 shows some resistance while NCo.339 is very susceptible and shows only slight recovery, but little lowering of yield due to infection could be detected. The presence of more than one strain of mosaic has been established. Ten varieties have been inoculated with ratoon-stunting disease and data are given on cane yields per acre of these varieties with and without hot water treatment. In most cases the presence of the disease caused a reduction in yield, which was reversed for some varieties by the hot water treatment.

2033 Rapport de l'Institut de Recherches sur la Canne à Sucre pour 1955. (**Report of the Sugar Cane Research Institute for 1955**).
Rev. agric. Maurice 1956 : **35** : 67–89.
The cane M134/32 has declined in importance in Mauritius whereas B3337, B37161 and B37172 are being grown more widely. Ébène 1/37 [Ebony 1/37], although having a higher sugar content than other varieties grown on the island, suffers from lack of resistance to drought, lodging and chlorotic streak. In variety trials, M129/43, M147/44 and M31/45 gave high yields of sugar per acre. M129/43 matured early but was susceptible to lodging. The juice of M147/44 had a high sugar content. A number of intervarietal crosses have been carried out to develop early-maturing varieties. It was found that canes grown at a high altitude produced a higher percentage of anthers and were more fertile than canes grown at low altitudes. Varietal differences in susceptibility to chlorotic streak and ratoon stunting are noted.

2034 SORNAY, A. DE
Nouvelles variétés de canne. (**New cane varieties**).
Rev. agric. Maurice 1956 : **35** : 118–22.
The performance of B34104, M147/44 and M31/45 in sugar-cane trials in Mauritius is discussed, with notes on their genetic origin and their biological and other characteristics, including quality of their juice, maturity, disease resistance and regional adaptation. All three canes tiller profusely and produce good yields of juice with a high sugar content.

2035 **Handbook for 1954 of the British West Indies Sugar Association (Incorporated)** : Pp. 102.
This handbook, providing a survey of various aspects of the sugar industry in the British West Indies, includes articles on the work of the Imperial College of Tropical Agriculture, technological research, breeding and variety testing in 1952 and 1953, field research in progress or planned, and the present position with respect to pests and diseases.

Proceedings of the 1954 meeting of the British West Indies Sugar Technologists held at the Imperial College of Tropical Agriculture, Trinidad, under the auspices of the British West Indies Sugar Association : Pp. 232.

2036 *Birkett, L. S. & Bourne, C. L. C. A study of plant analysis methods for determining the nutrient requirements of the sugar cane in British Guiana. (pp. 76–83).*
The differences in the percentages of N, CaO, MgO and P_2O_5 in the leaves of three varieties on two soil types are tabulated.

2037 *Evans, H. Field responses to complete fertilizer applications in British Guiana. (pp. 83–87).*
The results of analyses of the amounts of nitrogen, phosphorus and potassium in the leaves of a number of varieties when subjected to various levels of application of fertilizers are tabulated.

2038 *Hayot, H. Sugar-cane in Martinique. (pp. 99–100).*
The leading varieties for the various soil types and climatic regions of Martinique are listed, with notes as to their yields and the quality of their juice.

2039 *Bates, J. F. The status of moth borer in British Guiana. (pp. 126–36).*
Data are presented showing the percentage infestation of cane varieties grown in British Guiana by *Diatraea* spp. D3/44, B41227 and D123/45 showed less susceptibility to borer attack than the other varieties tested.

2040 *Hutchinson, P. B., Wiggins, L. F. & Wise, W. S. The fibre structure of cane varieties B37161 and B4362. (pp. 165–67).*
Anatomical studies of B37161 and B4362 have shown differences between the varieties in the amount of fibre in the nodal regions, B37161 having a larger cross-sectional area covered by fibres. It is suggested that these differences may be related to differences in the milling characteristics of the two varieties.

Memoria de la XXIX Conferencia Anual. Asociación de Técnicos Azucareros de Cuba. (**Report of the 29th Annual Conference of the Association of Sugar Technologists of Cuba**).
La Habana 1955 : Pp. 430.

2041 *Domínguez, R. B. Estudios comparativos con nuevas variedades realizados por la Estación Experimental de la Caña de Azúcar de Jovellanos. (Comparative studies of new varieties carried out by the Jovellanos Sugar-cane Experimental Station). (pp. 17–25).*
In continuation of the studies previously reported (cf. *PBA*, XXVI, Abst. 2648) it is stated that in some of the tests cane C540–47, which in the previous year was one of the low varieties in order of yield, moved to first place in the first ratoon crop.

Proceedings of the Jamaican Association of Sugar Technologists for the year 1955.
J.A.S.T. Journal : **18** : Pp. 54.

2042 *Smith, C. E. M. Review of the variety situation. (pp. 3–10).*
The present variety situation is described, together with the changes which have taken place since 1949 in the proportions of the various varieties grown in Jamaica. The performances of commercial canes and new selections are tabulated.

2043 *Chinloy, T. The effect of organo mercurials on sugar cane setts. (pp. 11–13).*
The effect of a number of organo-mercurial fungicides on the germination of setts of six varieties is tabulated. Increased yields were obtained from B4362 and B3439 when aretan was used to prevent decay of setts.

2044 MATHERNE, R. J. & HEBERT, L. P.
Results of sugarcane variety tests in Louisiana during 1955.
Sug. Bull., N. Orleans 1956 : **34** : 338–48.
Detailed results are given of variety trials on different soil types in Louisiana during 1955. CP44/101 and NCo.310 continued to perform well on both light and heavy soils, and a newly released, early maturing variety, CP48/103, has given good yields of sugar per ton of cane except in one locality.

2045 CHILTON, S. J. P., DUNCKELMAN, P. H., BREAUX, R. D., MILLS, P. J. & STEIB, R. J.
Sugarcane seedling work at Louisiana State University.
Sug. Bull., N. Orleans 1956 : **34** : 392–97.
This article gives a popular account of the work involved in the development of new sugar-cane varieties.

2046 BIESKE, G. C.
Varietal trials—1954 and 1955 seasons.
Cane Gr. quart. Bull. 1956 : **20** : 46–52.
Data are presented on the yields of cane and sugar of various varieties tested at 12 localities in Queensland.

2047 BIESKE, G. C.
Varietal trials—1954 and 1955 seasons.
Cane Gr. quart. Bull. 1956 : **20** : 24–28.
Preliminary reports are given of eight of a series of variety trials in Queensland, with the results expressed as tons of cane and sugar per acre.

2048 STAFFORD, T. J. & GOUAUX, C. B.
Outfield sugarcane variety trials 1955.
Sug. Bull., N. Orleans 1956 : **34** : 375–80.
Trials of 12 varieties have been carried out under different environmental conditions in Louisiana and the results for 1955 are presented and discussed in some detail. The most promising of the newer varieties are CP48–103 and

CP47–193 which give high yields of sugar per ton of cane. NCo.310 also yields well but it is late maturing, lodges readily and is susceptible to mosaic. Good resistance to *Diatraea saccharalis* is shown by CP36–105.

2049 Price, S.
Cytological studies in *Saccharum* and allied genera. I. Syncytes in certain clones of *Saccharum* and *Erianthus*.
Cytologia, Tokyo 1956 : **21** : 21–37.
Multinucleate and polyploid pollen mother cells, termed syncytes, were observed among normal $2n$ pollen mother cells in *S. robustum* ($2n$ = c. 104), *E. arundinaceus* ($2n$ = 60) and *S. sinense* x *S. spontaneum* ($2n$ = ca. 78–80). Of the three types of syncyte formation reported in plants, viz. (1) failure of cytocinesis during archesporial division, (2) passage of a nucleus from one pollen mother cell to another and (3) fusion of pollen mother cells, type (3) is thought to obtain in the present material. Stages in meiosis were seen in some of the syncytes and these, it is suggested, may lead to the formation of diploid pollen grains.

2050 Buzacott, J. H.
Breeding cane for milling qualities.
Proc. Qd. Soc. Sug. Tech. 1956 : 23rd Conf. : 21–31.
Investigations of characters affecting the milling properties of sugar cane, namely fibre content, ease of clarification of extracted juice and post-harvest deterioration of cane are reviewed. Of these the last is considered the most important but all are varietal characters and should be considered in the breeding of new varieties.

2051 Samuels, G., Landrau, P. (Jun.) & Capó, B. G.
Influence of fertility levels on the varietal response of sugarcane.
J. Agric. Univ. PR 1956 : **40** : 129–43.
Varieties tested in several localities in Puerto Rico showed disparities in response to different levels of N, P and K fertilizers. The significance of variety x fertilizer interactions in interpreting the results of variety trials is discussed.

2052 King, N. J.
The varietal factor in cyclone damage.
Cane Gr. quart. Bull. 1956 : **20** : 11–12.
Evidence from cyclone damage to sugar cane in north Queensland has shown that resistance to breakage and lodging is a varietal characteristic. Badila did not break, but lodged badly. High resistance both to breakage and lodging was shown by Q57, Q59 and Q44, whereas Vidar and Q50 were fairly resistant.

2053 Steindle, D. R. L.
Downy mildew disease found at Bundaberg.
Cane Gr. quart. Bull. 1956 : **20** : p. 7.
During an outbreak of *Sclerospora sacchari* on sugar cane in Queensland CP29/116 was virtually immune and NCo.310 and Pindar highly resistant.

2054 Kar, K. & Singh, D. R.
Some aspects of sugarcane mycology in Uttar Pradesh.
Proc. 24 Annu. Conv. Sug. Tech. Ass. India 1956 : Pt. I : 15–28.
This article includes details of varietal response to *Colletotrichum falcatum*, obtained from trials involving artificial inoculation carried out during the years 1951–1956, and details of percentage infection of varieties by *Ustilago scitaminea*, from four-year trials and lists of selected varieties recommended for the various regions of the state.

2055 Veiga, F. M.
Ratoon stunting disease in Brazil.
Cane Gr. quart. Bull. 1956 : **20** : 3–6.
The occurrence in Brazil of ratoon stunting disease in sugar cane was first found in H32–8560 late in 1953 and confirmed by the inoculation of healthy canes of other varieties with juice extracted from diseased canes of H32–8560. Three varieties derived from Co.290 were the most resistant: CB45–3 (Co.290 x Co.331), Co.419 (Co.290 x POJ28) and CB41–76 (Co.290 x POJ2878). It is suggested that the resistance of these varieties may be inherited from their *Saccharum barberi* parent.

2056 Schexnayder, C. A.
The effect of stunting disease of sugarcane on yields of cane and sugar in Louisiana, and the use of heat treatment for control.
Sug. Bull., N. Orleans 1956 : **34** : 349–55.
The effect of heat treatment on the yields of 19 varieties of sugar cane infected with ratoon stunting disease has been investigated and considerable differences in response between varieties have been found. In four varieties treated canes gave an increase in yield of 70% or more over untreated canes, in six varieties the increase was 15% or less and in two varieties treated cane showed a decrease in yield as compared with untreated cane.

2057 Sen, S. C. & Bhargava, J. C.
Effect of ecological factors and traumatism on juice quality. Pt. II. Effect of frost on sugarcane crop.
Proc. Sug. Tech. Ass. India 1955 (1956) : Spec. No. 21–29.

The effect of frost in reducing the sugar content of cane before cutting was found to be greatest in soft varieties, e.g. EK28, and least in varieties with a high fibre content in the stem, e.g. Co 453.

2058 Langford, W. R. & Stokes, I. E.
Improved sorghums produce high yields of silage and syrup.
Highlights agric. Res., Ala. 1956 : **3** : No. 2 : unpaginated.

Two newly released varieties of sorghum which have proved superior in both yield of syrup and silage production are described. Sart is a late maturing variety, 12–15 feet tall, which suckers freely and is resistant to lodging and to *Gibberella fujikuroi*. It gives a lower tonnage of stalks per acre than Hodo, but more syrup per ton, and sometimes more per acre. During a three-year trial period it produced less silage than Hodo (cf. *PBA*, XXII, Absts. 1304 and 2107). Tracy is a midseason variety, reaching 9′ to 12′ in height and resistant to lodging except during very high winds. It gives higher yields of syrup and silage than White African. Both Sart and Tracy outyielded Dixie 18 maize in silage production at four localities (cf. *PBA*, XXIII, Abst. 2866).

2059 Coleman, O. H. & Dean, J. L.
Sorgo nursery trials at the U.S. Sugarcane Field Station at Houma, Louisiana, in 1955.
Sug. Bull., N. Orleans 1956 : **34** : 397–99.

Data are provided on the yield, stage of maturity at harvest, lodging and disease rating of five new selections and four commercial varieties. In general the new selections proved superior; this is attributed to their greater disease resistance.

2060 Coleman, O. H.
The occurrence and description of a dry segregate in honey sorgo.
Agron. J. 1956 : **48** : 475–76.

A fuller account of work described in *PBA*, XXVI, Abst. 218, is presented.

2061 Willey, L. A.
Sugar beet trials: 1947-54.
J. nat. Inst. agric. Bot. 1956 : **7** : 592–96.

This report provides a summary of the results for 48 strains which completed their trials during the years 1947 to 1954, data being provided on the percentage of bolting and various aspects of yield as compared with Sharpe's Klein E. As a result of these trials Hilleshög E, Hilleshög N, Hilleshög Polyploid and Johnson's E are recommended for growing in Great Britain.

2062 **Strains of sugar beet.**
Fmrs'. Leafl. nat. Inst. agric. Bot. 1956 : No. 5 : Pp. 4.

This leaflet is a revision of that summarized in *PBA*, XXV, Abst. 1281, and gives brief descriptive notes of recommended and provisionally recommended British strains.

2063 Archimovitsch, A.
(**Breeding and seed-raising of the sugar beet in the USSR**).
Issled. Mater. Inst. Izučen. Istor. Kult. SSSR. (Invest. Mater. Inst. Stud. Hist. Cult. USSR) München : Ser. 1 : 1954 : No. 15 : Pp. 169. [Russian].

This is a full account of the material summarized in *PBA*, XXVI, Absts. 2661 and 3564.

2064 Mazlumov, A.
[**Breeding work on sugar beet (at the Ramonj research station)**].
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 9 : 42–43. [Russian].

This report on breeding work at Ramonj mentions the Ramonj strains 06, 632, 931, 1537, 023 and 057, all distinguished by high root and sugar yields and resistance to drought and bolting. Ramonj 023 and Ramonj 057 have been especially bred for cultivation in squares and have a 0·6–0·8% higher sugar content than the other varieties.

Vsesojuznyĭ Naučno-issledovateljskii Institut Saharnoĭ Svekly (VNIS), Bjulletenj Naučno-tehničeskoĭ Informacii. (**All-Union Research Institute for Sugar Beet, Bulletin of Scientific-Technological Information**).
Kiev 1956 : No. 1 : Pp. 68. [Russian].

The following items contain information on plant breeding:—

2065 *Orlovskiĭ, N. I.* (*Achievements in breeding sugar beet*). (*pp. 5–9*).

The new varieties referred to include sugar beets resistant to mildew (*Erysiphe*) or to *Cercospora*, forms free from bolting and the first monogerm beets to be introduced into general cultivation. The quick-growing early varieties and the late varieties that keep their leaves proved the most successful in respect of yield, sugar content and resistance to root rots, *Cercospora* and storage rot.

2066 *Fedorov, A. I.* (*Intervarietal sexual crosses of sugar beet*). (*pp. 10–12*).

Increases of 4–5 c. per ha. in sugar yield were obtained by crossing varieties belonging to different types, such as B1612, a normal type with a tendency towards bolting, with R632, a tonnage type with a medium tendency towards bolting or with U751, a drought-resistant tonnage type free from bolting.

2067 *Bisoveckiĭ, T. Ja.* (*Yield of monogerm sugar beet and the cost of labour for cultivation with different types and densities of sowing*). (*pp. 13–15*).

Data are presented showing that the yield of sugar per unit area from monogerm sugar beets is equal to that from the old varieties and under suitable conditions of square planting may even be slightly higher.

2068 *Hučua, K. N.* (*Supplementary pollination of sugar-beet stecklings*). (*pp. 45–47*).

Increases of up to 2·4 c. per ha. in yield of seed are reported as a result of four supplementary pollinations.

2069 *Ševčenko, V. N.* (*Results of interstation variety tests of sugar-beet material—the products of selection for resistance to diseases in 1955*). (*pp. 48–53*).

Several varieties displaying resistance to root-rotting organisms are mentioned. All exceeded the standard RO6 in sugar content and some also in yield. Varieties resistant to *Cercospora* exceeded the standard in sugar yield in years of severe infection.

Other varieties are mentioned for their resistance to storage rot.

2070 Baser, N.
Fifty-to-one dividend from beet sugar research.
Canner and Freezer 1956 : **123** : No. 5 : 16–19.

A popular account is given of recent developments in sugar-beet breeding in the USA, special reference being made to monogerm seed production and the use of atomic irradiation techniques.

2071 Tolman, B. & Johnson, R.
Materials and methods used in producing commercial male-sterile hybrids.
J. Amer. Soc. Sug. Beet Tech. 1956 : **9** : 153–60.

The methods used by the Utah-Idaho Sugar Company in producing commercial monogerm male-sterile hybrid seed are outlined. Both cytoplasmic and nuclear male sterility are employed. In order to obtain vigorous male-sterile seed stock, a different pollinator may be used during each year of multiplication, so that hybrid vigour is maintained. In the production of the commercial hybrid seed one of two types of pollinator is used, either a commercial variety or an F_1 hybrid developed from a line carrying Mendelian male sterility; variety trials indicate that the F_1 hybrid SLT824aa x CT9 is the best pollinator. The proportions of seed used for hybrid seed production are 1 pound pollinator seed : 20 pounds male-sterile seed.

Tables are provided showing relative yields of various hybrids and commercial varieties. In almost every case the hybrid has yielded significantly more than the commercial varieties, both in tons of roots per acre and in gross sugar per acre, although not in sugar percentage. Some promising new hybrids have a high sugar content as well as a high yield.

2072 Filutowicz, A.
Wyniki chowu krewniaczego 4 pokoleń buraka cukrowego i efekt heterozji uzyskany przy skrzyżowaniu I_3. (**Results of inbreeding sugar beet for four generations and the heterotic effect obtained on crossing the I_3).**
Acta agrobot., Warszawa 1954 : **2** : 137–50.

Inbreeding by sib crossing in each of two strains resulted in a marked decline in yield of roots and a slight increase in sugar content. Two morphologically and physiologically distinct lines with red and unpigmented hypocotyls respectively were isolated in the third generation of inbreeding in each strain. In both intrastrain and interstrain crosses, hybrids between lines differing in pigmentation showed pronounced heterosis in yield of roots and sugar per hectare.

2073 Kloen, D.
De opbouw van tetraploide families van suiker- en voederbietenrassen. I. Colchicinebehandeling, opkweken van C_0 en C_1. (**The production of tetraploid families of sugar-beet and mangel varieties. I. Colchicine treatment, raising of C_0 and C_1).**
Zaadbelangen 1956 : **10** : 271–74.

The merits of tetraploid sugar-beet and mangel varieties are discussed in general terms; at the present time tetraploid varieties are grown on 40% of the land devoted to sugar-beet cultivation in the Netherlands. The writer outlines the technique employed in obtaining tetraploids by treating germinating seeds with colchicine solution, the selection of tetraploid plants in the

C_0 and C_1 by means of cytological examinations and the use of artificial lighting and heating to accelerate the production of seed by the C_0 and C_1.

2074 Peev, H. V.
(The dynamics of growth and development of beets during the first growth season).
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1956 : **3** : 187–96. [Bulgarian].

Forms distinguished by greater earliness were found among the plants of a sugar beet and a mangel variety studied at Sofia. It is thought that by selecting the early types new varieties may be developed.

2075 Mochizuki, A. & Sueoka, N.
Genetic studies on the number of plastid in stomata. 1. Effects of autopolyploidy in sugar beets.
Cytologia, Tokyo 1955 : **20** : 358–66.

The number of chloroplasts in the guard cells of the leaves of 2*x*, 3*x* and 4*x* autopolyploid beets was studied. Marked differences were found between the groups, the number increasing with degree of polyploidy. Within each group there was some variation depending upon stage of development of the plant, size of leaf and size of stomata.

2076 Finkner, R. E. & Bauserman, H. M.
Breeding of sugar beets with reference to sodium, sucrose, and raffinose content.
J. Amer. Soc. Sug. Beet. Tech. 1956 : **9** : 170–77.

From among approximately 1200 roots of an élite stock of American 1, selected for their size, shape and good crowns, seven groups were selected, six of them on the basis of, respectively, (*a*) high sucrose and low sodium content, (*b*) high sucrose and high sodium, (*c*) high raffinose, (*d*) low raffinose, (*e*) the coefficient sucrose percentage x (1 — sodium percentage), and (*f*) high sucrose; the seventh group (*g*) was a randomly selected control. Highly significant differences in yield of roots, yield of sugar, and percentages of sucrose, raffinose and sodium were found among the progenies of the different groups. Groups (*c*) and (*d*) bred true for high and low raffinose contents respectively and groups (*a*) and (*b*) for their respective combinations of high sucrose with high and low sodium contents, showing that the high negative correlation between sucrose and sodium in the original population could easily be broken. The progeny from group (*f*) had a slightly but not significantly higher sucrose content than that from group (*c*), indicating that low sodium content is not of importance in selecting for high sucrose.

2077 Wood, R. R., Oldemeyer, R. K. & Bush, H. L.
Inheritance of raffinose production in the sugar beet.
J. Amer. Soc. Sug. Beet Tech. 1956 : **9** : 133–38.

Studies of the F_1, F_2 and back-cross populations of a cross between the two inbred lines 410701 and 50–415, the former having a high and the latter a low raffinose content, indicated that both parents were homozygous for factors governing raffinose production. About five additive genes, all equal in effect, appeared to be involved, one of them coming from the parent with a low raffinose content. No dominance, heterosis or linkage effects were observed.

2078 Filutowicz, A.
Wyniki hodowli buraków cukrowych o skróconym korzeniu. **(Results of breeding sugar beet for short roots).**
Acta agrobot., Warszawa 1954 : **2** : 81–88.

Sugar beets with short conical roots suitable for mechanical harvesting and for cultivation on shallow soils have been selected from diploid material derived from a diploid x triploid cross. They have desirable sugar content but further selection is required since they tend to form globular roots with a low sugar content.

2079 Land Jensen, H. & Norgård Pedersen, E. J.
Keglepropmetoden til bestemmelse af tørstofindholdet i roer. **(The conical plug method for the determination of dry matter content in beets).**
Tidsskr. Planteavl 1956 : **60** : 218–52.

The above method, which involves making dry matter determinations on samples consisting of three conical borings from each root, has proved more rapid and less costly than the usual sawing method and gives almost identical results.

2080 Afanasiev, M. M.
Resistance of inbred varieties of sugar beets to Aphanomyces, Rhizoctonia, and Fusarium root rots.
J. Amer. Soc. Sug. Beet Tech. 1956 : **9** : 178–79.

An interim report on investigations on the resistance of inbreds to the above diseases is presented. So far, of several hundred varieties subjected to preliminary tests, none has shown a satisfactory degree of resistance to *Aphanomyces cochlioides*, 19 have proved highly resistant to *Rhizoctonia* root root and 22 are resistant to *Fusarium* root rot; four varieties were resistant to both the two last-mentioned diseases.

2081 Polevoĭ, V. V. & Čebolda, V. F.
(Results of producing sugar-beet varieties resistant to mildew).
Trud. Kirgiz. opyt.-selekc. Stanc. Sahar. Svekl. (Trans. Kirgiz. Sugar-beet Breed. Sta.), Frunze 1956 : No. 1 : 95–98. [Russian].

Selection for mildew resistance was started in 1941 and in 1953 some 40% of the breeding lines at the Kirgizian Sugar-beet Research Station were resistant to mildew. F–986, the most resistant line, has surpassed standard varieties by 5·1% to 8·6% in sugar yield and is being tested in the state variety trials.

2082 Finkner, R. E. & Swink, J. F.
Breeding sugar beets for resistance to nematodes.
Agron. J. 1956 : **48** : 389–92.

Varietal differences in resistance to *Heterodera schachtii*, as measured by sugar yield on infested ground, were observed among 16 strains, indicating that resistance is genetically controlled and may respond to selection. Low galactinol content was associated with yield and may be a factor determining resistance.

STIMULANTS

2083 Sand, S. A.
Correlated effects of temperature on somatic and germinal mutation in a clone of variegated *Nicotiana*.
Genetics 1956 : **41** : p. 659. (Abst.).

Flowers of clone S5230–5, of interspecific-hybrid origin, display sectors of speckled tissue on the normally red petals. The clone is heterozygous ($v_S v_s$) for locus *v*, variation in the frequency of speckled sectors in the clone and of the speckled progeny obtained by selfing being assumed to reflect alteration in the frequency of somatic and germinal mutation respectively at this locus. The frequency of speckled sectors in the parental clone and of speckled offspring increased as the temperature rose, when the clone was grown at 50°, 60°, 70°, and 80° F.

2084 Scarascia, G. T., Scarascia-Venezian, M. E. & Giovannozzi-Sermanni, G.
Sull'invecchiamento del seme di Nicotiana. Osservazioni citologiche e biochimiche. **(Aging of seed of Nicotiana. Cytological and biochemical observations).**
Tabacco, Roma 1956 : **60** : 278–85.

Gradual changes in the content of various enzymes, aminoacids and sugars are reported during aging of seeds of *N. tabacum* and *N. rustica*. The data lead to the conclusion that the fall in germinating capacity and the increase in chromosome aberrations in aging seeds are brought about by the accumulation of some liposoluble substance in the cells.

2085 Bhat, N. R. & Krishnamoorthi, T.
A male sterile mutant in *N. tabacum*.
Curr. Sci. 1956 : **25** : 297–99.

A male-sterile plant with deformed, indehiscent anthers was found during the 1952–53 season at the Central Tobacco Research Institute at Rajahmundry in an otherwise normal field of Harrison Special. F_1 plants derived from seed from this plant and from a cross with Golden Harvest were all normal, but some male-sterile plants appeared in the F_2 generations. Details of F_3 segregations from both crosses are given from which it is concluded that male sterility in this case is heritable and controlled by two gene pairs.

2086 Hagiya, K.
(Physiological studies on stored tobacco pollen. I. On the duration of the capacity for fertilization and its progressive decline in effectiveness).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1948 : **61** : 123–26. [Japanese].

Hagiya, K.
(Physiological studies on the storage of tobacco pollen. II. On germination capacity and fertilization capacity with special reference to the difference between them).
Ibid. 1949 : **62** : 9–13. [Japanese].

Hagiya, K.
(Physiological studies on the storage of tobacco pollen. III. On the seeds and plants in the next generation).
Ibid. 1949 : **62** : 49–52. [Japanese].

Cf. *PBA*, XXI, Abst. 1230.

2087 Rogers, C. H.
Some facts concerning Coker 139.
Rhod. Tob. J. 1956 : **8** : No. 8 : 78–81.

Complaints have been made by the trade that the flue-cured crop produced in the USA in the 1955 season contained a high proportion of pale, slick tobacco. Various reasons are given showing that criticism of the new variety Coker 139 (cf. *PBA*, XXV, Abst. 3297), which formed a large part of the crop, is founded upon misinformation.

2088 Filipenko, N. I.
(The standardization of tobacco varieties in the Crimea).
Tabak (Tobacco) 1956 : No. 3 : p. 8. [Russian].

It is urged that Ostrolist [Pointed-leaf] and other large-leaved tobaccos should be replaced by high-quality varieties, the areas under which have diminished in recent years. In this connexion mention is made of a new variety, American 287s, which outyields American 572 and nearly equals it in aromatic properties. Reintroduction and improvement of American 572 and Dubec 44, notable for their high quality leaf, is urged.

2089 Moore, E. L. & Drolsom, P. N.
An aberrant flavor in breeding lines of flue-cured tobacco.
Agron. J. 1956 : **48** : 529–30.

An F_4 family and subsequent selections from a cross between Dixie Bright 102, which is highly resistant to black shank and bacterial wilt but gives low yields, and Hicks, which yields high-quality cigarette leaf, were all black-shank resistant and were visually judged to be of high quality. Smoking tests showed, however, that an increasing proportion of plants in the successive selections had an undesirable cigar-like flavour.

2090 Moore, E. L., Drolsom, P. N., Todd, F. A. & Clayton, E. E.
Black shank resistance in flue-cured tobacco as influenced by tolerance to certain parasitic nematodes.
Phytopathology 1956 : **46** : 545–50.

A fuller account is given of work reported in *PBA*, XXVI, Abst. 230.

2091 **(A highly resistant tobacco variety).**
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 4 : p. 22. [Russian].

Talass 3036 was bred at the Tobacco Institute. In Kirgizia it outyielded the standard Trebizond 1272 by 32% and produced twice the amount of high-quality leaf. It is immune from *Erysiphe* and tobacco mosaic virus and has a fine aroma.

2092 Wight, W. & Barua, D. N.
The genetical significance of calcium oxalate crystals in tea.
Two and a Bud, Tocklai 1956 : **3** : No. 2 : p. 5.

Investigations have shown that the average number of calcium oxalate crystals in plants of one clone is correlated with other characteristics of that clone, e.g. growth rate, and it is suggested that the crystal count of a plant can be used as an indication of its potential agronomic value.

2093 Carvalho, A. & Antunes Filho, H.
Genética de *Coffea*. XVIII—Variegação no cafeeiro. **(Genetics of *Coffea*. XVIII. Variegation in the coffee tree).**
Bragantia 1954 : **13** : 85–93.

Various types of variegation that have been encountered in coffee trees are described. On selfing, some of them gave all normal green progeny and some produced variegated seedlings in various proportions; when the selfed progeny from flowers on green and on variegated branches were kept separate a larger proportion of variegated seedlings was obtained from the former than the latter.

In pollinations between flowers on variegated branches and normal trees the variegation was transmitted only by the seed parent in most cases; certain types of variegation in which the leaf texture was also abnormal seemed, however, also to be transmissible through the pollen. Attempts to transmit the variegation by means of grafting all gave negative results.

2094 Antunes Filho, H. & Carvalho, A.
Genética de *Coffea*. XIX—Mutação somática afetando a côr das fôlhas em café. **(Genetics of *Coffea*. XIX. Somatic mutation affecting leaf colour in coffee).**
Bragantia 1954 : **13** : xi–xiv.

The bronze colour of the leaves of *C. arabica* var. *purpurascens* is due to a recessive gene and when this form is crossed with normal green its back cross to var. *purpurascens* segregates in a ratio of 1 green : 1 *purpurascens*. One of the green plants in the back cross however produced one branch on which all the leaves were *purpurascens*, some leaves on other branches showing the character too. The change is ascribed to the mutation of a gene for green pigmentation and to loss of a chromosome segment.

2095 Carvalho, A., Antunes Filho, H. & Nogueira, R. K.
Genética de *Coffea*. XX. Resultados preliminares do tratamento de sementes de café com raios-X. **(Genetics of *Coffea*. XX. Preliminary results of treating coffee seeds with X rays).**
Bragantia 1954 : **13** : xvii–xx.

Seeds from selfed flowers of *C. arabica* var. *bourbon* and var. *purpurascens* and of hybrids between them were treated with X rays at doses from 4200 to 150,000 r.; doses above 14,300 r. proved lethal. One seedling showed signs of variegation and most of them were weak in growth.

2096 CARVALHO, A. & ANTUNES FILHO, H.
Genética de *Coffea*. XXII. Novas observações sôbre a influência do alelo *na*, na produção dos cafeeiros. (**Genetics of *Coffea*. XXII. Further observations on the influence of the allele *na* on the yield of coffee trees**).
Bragantia 1955 : **14** : 267–76.

Data presented show that plants of *C. arabica* var. *murta*, which are heterozygous for the dwarf gene *na*, were less vigorous and yielded 70–100% less than plants of var. *bourbon* from the same progenies. In dwarf trees that were homozygous for *nana* the yield was practically nil and few if any flowers were formed.

The trees with the highest yield in the Murta group did not come from the same progenies as those with the highest yield in the Bourbon group and yielding ability is evidently controlled by a group of polygenes as well as the gene *Na*.

2097 JONES, P. A.
Notes on the varieties of *Coffea arabica* in Kenya.
Mon. Bull. Coffee Bd. Kenya 1956 : **21** : 305–09.

Notes are given on the origin and characteristics of many varieties and selections, most of which are included in the programme of trials initiated in 1950.

2098 MENDES, A. J. T.
Observações citológicas em *Coffea*. XIX. Monossômios. (**Cytological observations in *Coffea*. XIX. Monosomics**).
Bragantia 1955 : **14** : 137–40.

Seedlings from a fully homozygous plant of *C. arabica* var. *bourbon* ($2n = 44$) produced by chromosome duplication of a haploid plant with $2n = 22$ varied somewhat in vigour and one of them proved to be a *monosperma* mutant with $2n = 22$; a second was a *mucronata* mutant in which the Bourbon genotype *ttNaNa* seemed to have mutated to *ttNana* and a third an *angustifolia* mutant, *AgAg* having changed to *agag*. The two latter mutants both proved to be monosomic ($2n = 43$). An examination of several other *angustifolia* mutants in the collection showed some of them to be monosomics too. They probably arise by the union of a pollen grain with $n = 21$ with a normal egg cell having $n = 22$.

2099 ALVES, A.
Melhoramento do cafeeiro. VIII. Novas determinações sôbre poliembrionia, sementes sem embrião e lojas dos frutos sem sementes em *Coffea*. (**Improvement of coffee. VIII. Further determinations of polyembryony, germless seeds and seedless locules in *Coffea***).
Bragantia 1955 : **14** : 285–300.

Cases of two, three and even four seeds per locule were observed in *C. arabica*, and in some forms of *C. congensis* and *C. dewevrei* this form of false polyembryony was particularly frequent. Seeds with more than one embryo were observed in *C. arabica* vars. *angustifolia* and *erecta* and in some of the hybrids more frequently than in var. *typica* and in other species. Certain varieties, such as Caturra Amarelo [Yellow Caturra] and *C. dewevrei*, *C. canephora* and *C. liberica* x *C. dewevrei* had a high proportion of fruits with empty locules and in Caturra Amarelo some plants differed from others of the same variety in having many germless seeds; this defect was also observed in the hybrid *C. liberica* x *C. dewevrei*.

2100 MENDES, A. J. T., MEDINA, D. M. & CONAGIN, C. H. T. MENDES
Citologia do desenvolvimento dos frutos sem sementes no café "Mundo Novo". (**Cytology of development of the seedless fruits in Mundo Novo coffee**).
Bragantia 1954 : **13** : 257–79.

Meiotic irregularities were observed with equal frequency in plants which normally bear a large and a small number of empty seeds respectively, in both of which the irregularities were more frequent than in other varieties of *Coffea arabica*. Observations on the development of the embryo and endosperm in emasculated flowers with and without pollination showed it to be similar in both types of Mundo Novo and in normal varieties of Bourbon, though slightly more rapid in Bourbon. Various anomalies of development were observed in Mundo Novo but they were almost equally frequent in the two types. In the type with high frequency of seedless fruits, however, in some of the fruits a small disk of endosperm tissue 2–3 mm. in diameter and 0·5 mm. in thickness, surrounded by perisperm, took the place of the normal endosperm; these discoid endosperms were more frequent after selfing than after cross pollination with normal types and in pollinations with Bourbon there were none at all. The phenomenon is thus thought to be due not to the cytological irregularities referred to, which may account for the empty fruits without discoid embryos which occur in both types, but to a gene *d*, which in the heterozygous state *Dd* produces discoid endosperm and in the homozygous state *dd* is inviable.

2101 MENDES, A. J. T. & MEDINA, D. M.
Contrôle genético dos "frutos chochos" no café "Mundo Novo". (**Genetical control of empty fruit in Mundo Novo coffee**).
Bragantia 1955 : **14** : 87–99.

Further observations (cf. Abst. 2100) have shown that the plants characterized by high frequency of seedless fruits are those which produce the discoid endosperm and the 15 hybrid progenies could be classified quite clearly according to this character, those with discoid endosperm having an average of 35·3 empty locules per 100 fruits, those without an average of 6·3; in the 11 segregating progenies the segregation was in the proportion 71 normal : 126 with discoid endosperm, which corresponds to a ratio of 1*DD* : 2*Dd*, the *dd* homozygotes being inviable. The remaining 4 progenies did not segregate and evidently arose from normal (*DD*) trees; the few plants with discs that occurred (3 out of 65) are ascribed mainly to out-pollination but may occasionally be due to physiological causes too.
The proportion of normal plants and plants with discs was counted in other populations of Mundo Novo coffee and corresponded closely with the ratio 50·79 *DD* : 49·21 *Dd* expected if the plants from which they had originated were *Dd* and there was 10% of out-pollination. By selecting only plants with a low proportion of empty seeds it should be possible to eradicate the defect completely.

2102 MENDES, A. J. T. & CONAGIN, A.
Produtividade e rendimento das duas classes de plantas existentes no café Mundo Novo. (**Fruit and seed yields of the two classes of plants existing in Mundo Novo coffee**).
Bragantia 1955 : **14** : 101–07.

The plants with a high proportion of seedless fruits (cf. Abst. 2100) are shown to yield a significantly higher weight of fruits per tree than the normal plants whereas the mean weight of seeds per fruit was 16·3% less, the net result of which is that the total yield of seed per plant in the two groups is roughly equal. Thus by selecting seed from high-yielding plants free from seedless fruits it is possible to eliminate this defect while at the same time improving yielding ability.

2103 KNIGHT, R.
Induced polyploidy in *Theobroma cacao* L. and related species.
J. hort. Sci. 1957 : **32** : 1–8.

Treatment of the apical bud with 0·6% colchicine in agar for 24 hours soon after germination was found to be a satisfactory method of inducing tetraploidy in *Th. cacao* at the West African Cocoa Research Institute, Tafo, Gold Coast. Tetraploidy resulted in larger stomata, a lower frequency of stomata per unit area, change in leaf shape, greater thickness of the leaf and darker-coloured and more pronounced veins. Attempts to distinguish periclinal chimeras on the basis of the frequency of the stomata failed. Polyploid sectors of the main stem were eventually replaced by completely 2*n* or 4*n* layers but periclinal chimeras persisted. Induction of polyploidy was less successful in other species and completely unsuccessful in interspecific hybrids. The possible effects of polyploidy upon yield in cacao and the probable value of periclinal chimeras in elucidating the nature of the flower-bearing "cushions" are discussed.

2104 MÜNTZING, A.
Differential periodicity among clones of cacao.
Hereditas, Lund 1956 : **42** : 508–14.

Clones tested on the Clementina estate near Babahoyo, Ecuador, showed marked differences in periodicity of pod production. The Ecuadorian clones, SCA12 from the upper Amazon region and three of the ICS clones from Trinidad had their maximum production in the second quarter of the year, during or shortly after the rainy season. Although the rainy period favours fungus attack, the percentages of diseased pods produced by SCA12 and the Ecuadorian clones during this time were low; they were however high in all ICS clones. Only those ICS clones giving maximum production during the dry season are therefore likely to be useful for the estate in question.

2105 KOOPMANS, A.
Enkele cytogenetische aspecten binnen het geslacht *Papaver*. (**Some cytogenetical aspects within the genus *Papaver***).
Genen en Phaenen 1956 : **1** : No. **3** : 5–7.

The results of studies at the Genetical Institute of Groningen University, Netherlands, on *P. argemone* ($2n = 40$), *P. nigrotinctum* ($2n = 12$), *P. dubium* ($2n = 28$ or 42) and *P. somniferum* ($2n = 22$ or 44) are reported. Meiosis in all these species tended to be somewhat irregular, univalents and lagging chromosomes being observed. Crosses between *P. argemone* ♀ and *P. nigrotinctum* ♂ were easily effected, the F_1 proving fertile and morphologically similar to the ♀ parent; the F_2 segregated into a large number of different types. The cross *P. nigrotinctum* ♀ x *P. argemone* ♂ was less successful and the F_1 was largely sterile. Crosses of *P. dubium* with 28 chromosomes with *P. dubium* with 42 chromosomes gave rise to a large number of dwarf plants. Crosses of *P. somniferum* with 22 chromosomes with either of the two *P. dubium* types gave rise to fertile F_1 progenies.

Annual Report of the Department of Hop Research, Wye College, 1955 : Pp. 155.

2106 *Darling, H. S. Review of the 1955 hop season at Wye College. (pp. 19–21).*
High yields of good quality were given by Bullion and Brewer's Gold, but the yields of Goldings and John Ford were reduced by a severe attack of *Pseudoperenospora humuli.*

2107 *Neve, R. A., Farrar, R. F. & Salmon, E. S. Plant breeding section. Review of the year's work. (pp. 22–26).*
A large number of selections have been tested for *Verticillium* wilt tolerance at Wye and at East Malling. Some varieties have suffered serious damage from a soil-applied systemic insecticide containing dimefox.
Colchicine-induced tetraploid plants of Fuggle were pollinated by wilt-tolerant males and a large number of triploid progeny obtained. Other varieties have also been treated with colchicine and tetraploid tissue has been obtained from Eastwell Golding.
Five American seedlings have been tested at East Malling for wilt tolerance. The most satisfactory of these seedlings were OW99 (a seedling of OR55) with 70% of the plants infected and AOR10 with 73%, compared with OR55 with 38% and Fuggle with 93% infection.

2108 *Thompson, F. C., Beard, F. H. & Cripps, E. G. Field experimentation and plant nutrition section. Review of the year's work. (pp. 27–34).*
Data are provided on the yield, dry weight per pound and bushels per cwt. of 56 varieties. In a trial of four varieties at Sissinghurst, Early Choice and Northern Brewer showed the best growth, although the latter and Norton Court Golding suffered a severe attack of *Ps. humuli.* At Farningham, Northern Brewer showed the best growth and ripened early. This variety, Norton Court Golding and College Cluster showed less resistance to *Ps. humuli* than the other varieties and at the end of the season were infected by *Sphaerotheca humuli*, while Early Choice, Sunshine and Pride of Kent remained uninfected.

2109 *Farrar, R. F., Neve, R. A. & Weston, E. W. Inheritance of resin characters in hops. (pp. 52–59).*
No correlation has been found between the number of resin glands per flower of a male hop and the resin content of cones from its female relatives, nor between anther glands and cone resin content of monecious hops. It was found that factors governing the α-resin and β-resin contents of the cones were inherited independently.

2110 *Farrar, R. F. An investigation into the seed content of triploid hops. (pp. 68–77).*
Data resulting from an investigation of the seed content of cones from diploid and triploid Bullion (Q43) have shown that the triploid plants, though not seedless, produce only a small number of seeds. Figures are provided of the numbers of cones and seeds, average numbers of seeds per cone and average weight of the seeds of three diploids and fifteen triploids.

2111 *Beard, F. H. & Thompson, F. C. Height of wirework and spacing trial. (pp. 78–83).*
The results of a three-year trial are summarized and discussed. Fuggle shows a marked increase in yield per hill with increase in spacing, at all heights, the effect of spacing being highly significant, but the yield per acre decreases with increasing width of spacing. With John Ford the interaction effect between height and spacing is significant and there is a highly significant rise in yield per hill with increase in spacing. Bullion shows a highly significant effect, in respect of yield per acre, with increase in height, and Brewer's Gold a significant increase in yield per hill with wider spacings. A pronounced decrease in resin content was found in Brewer's Gold and John Ford with increased width of spacing.

2112 *Neve, R. A. The place of polyploidy in hop breeding methods. (pp. 124–29).*
The author discusses the advantages to be gained from the use of tetraploid plants in hop breeding. Where several genetic factors are involved the chances of duplicating the characters of the female parent are much greater if that parent is tetraploid than if it is diploid. Where it is desired to introduce a new character from

the male side, if the desired character is controlled by a dominant gene the degree of polyploidy of the female parent will have no effect on the frequency with which this character will appear in the progeny. However if the character is controlled by a recessive gene, and the female parent is already heterozygous for this character, 50% of the progeny from a diploid female parent should exhibit the desired character, while only 17% of the seedlings from a tetraploid would be expected to do so. It is concluded that the use of tetraploid parents would overcome the difficulties arising from the heterozygous nature of the crop, where success can be expected in one generation, but since the progeny of a tetraploid parent are highly sterile, diploid parents must be used when more than one generation of breeding is necessary.

2113 *Salmon, E. S. The challenge cups for new varieties of hops. (pp. 135–41).*

The results of the 1955 competition among growers are reported.

2114 WEBB, J. I.
Institute of brewing trials with Wye variety hops, 1953 and 1954.
Ann. Bookl. Ass. Growers New Var. Hops 1956 : 12–16.

The characteristics are discussed of seven varieties which have undergone trials in England for at least two of the years 1952–1955. D3, D1 and J2 are considered promising as replacements for Fuggle (cf. *PBA*, XXVI, Abst. 1614).

2115 JARY, C. L. & BEARD, F. H.
New varieties. Summary of present position.
Ann. Bookl. Ass. Growers New Var. Hops 1956 : 4–11.

Detailed information is provided concerning the valuation, brewing demand, cropping capacity, general characteristics and other points of interest of the hop varieties now grown in England and of some wilt-tolerant seedlings still under trial at Wye and East Malling. (Cf. *PBA*, XXVI, Abst. 1613).

2116 CHRISTIE, T.
Black root-rot, *Phytophthora cactorum* (Leb. and Cohn) Schroet, of the hop plant.
NZ J. Sci. Tech. 1956 : **38** : 277–84.

Data are provided on the response of seven hop varieties to *Ph. cactorum* when artificially inoculated once or twice before planting. In confirmation of field experience Fuggle was found to be most resistant and Californian most susceptible.

MINOR CROP PLANTS

2117 DASKALOV, H. & MURTAZOV, T.
(New heterotic *Capsicum* varieties for cultivation under glass or early outdoor production).
Izv. Inst. Rasten., Sofija 1955 : No. 3 : 3–17. [Bulgarian].

Some intervarietal *Capsicum* hybrids from the Bulgarian Plant Institute are distinguished by earliness and heterosis for yield. Some have high sugar and vitamin C contents.

2118 Verslag der werkzaamheden van de werkgroepen van de Stichting voor Oliehoudende Zaden betreffende olievlas en koolzaad over de jaren 1953 en 1954. **(Report of the activities of the working groups of the Institute of Oil Plants concerning linseed and rape during the years 1953 and 1954).**
Meded. ned. Vlasinst. Wageningen Sticht. Oliehoudende Zad. 1955 : No. 25 : Pp. 29. (Mimeographed).

Rape. Three of the lines selected at the station in 1953 outyielded the standard Lembke. Varietal differences in susceptibility to *Alternaria brassicae* were noted but these were usually insignificant. Varieties of French origin proved considerably less winter hardy than varieties from the Netherlands and Scandinavia. Some viable seeds were obtained from the cross *Brassica rapa* var. *oleifera* x *B. oleracea.* Tetraploid forms of rape were obtained by treating the growing shoots with a colchicine solution but no seeds were produced by the tetraploid plants. Crosses were carried out to study the genetics of the inheritance of different flower colours.

Linseed. The results of variety trials are discussed; the French variety Pastel gave the highest yields of seed and had the highest 1000-grain weight and Dæhnfeldt had the highest oil content. Varietal differences in number of capsules per plant and number of seeds per capsule are noted. Selection of lines giving improved yields of oil per given area and with a higher oil content is being carried out as is also selection for increased resistance to *Polyspora lini*, *Alternaria* sp., *Ascochyta* sp. and lodging. Some of the lines selected in 1953–54 outyielded the standards Dæhnfeldt and Pastel by 10–15%.

2119 ANDERSSON, G., OLSSON, G. & LÖÖF, B.
Svalöfs Rapidorybs II och Svalöfs Duro höstrybs. **(The Svalöf turnip rape Rapido and winter turnip rape Duro).**
Sverig. Utsädesfören. Tidskr. 1956 : **66** : 232–45.

Rapido II was described in *PBA*, XXIV, Abst.

2746. Duro (Lembkes x Rapido I) exceeds Rapido II in both seed yield and oil content by 4% and is also superior in vigour and resistance to lodging. It equals Gruber in hardiness and is suited to southern Sweden.

2120 **Improved castor.**
Indian Fmg. 1956 : **6** : No. 7 : p. 11.

A new variety of castor oil plant, S20, is recommended for Bombay state, since it matures earlier and gives higher yields than the local variety although its seeds are smaller.

2121 JAKOB, K. M.
The pachytene chromosomes of the castor oil plant.
Cytologia, Tokyo 1956 : **21** : 76–80.

The ten chromosomes of *Ricinus communis* could be identified at pachytene on the basis of the arrangement of the macrochromomeres upon them. Chromosomes A, D, E, F and J were the most distinct.

2122 SRIVASTAVA, R. N.
Production of fertile autotetraploids in sesame and their breeding behavior.
J. Hered. 1956 : **47** : 241–44.

The most effective concentrations of colchicine for the induction of tetraploids by treatment of presoaked seeds were a 0·06% solution for six hours or a 0·10% solution for four hours. The tetraploids exceeded the diploids in plant height and in size of leaves, flowers, capsules, seeds, pollen grains and guard cells. The tetraploids showed 20–25% sterility and the diploids 5–25%. The cross 4*x* x 2*x* yielded a few seeds when the diploid progenitor of the autotetraploid was used as the diploid parent but set no seed when other diploids were used; the reciprocal crosses were all unsuccessful.

2123 MAZZANI, B.
"Aceitera", una nueva variedad de ajonjolí producida en el Centro de Investigaciones Agronómicas. (**Aceitera, a new variety of sesame produced at the Centre for Agronomic Investigations**).
Agron. trop., Venezuela 1955 : **5** : 37–44.

The variety Aceitera [Oil Bearer] was produced by sowing together three lines from the cross Selection 2 x Banco, selecting the best plants of each and bulking them. It is vigorous in growth, has strong, unbranched stems, a wide range of adaptability and an oil content of 57·8% in the dry seeds. Its seed yield is good though not quite so high as that of Acarigua.

2124 MAZZANI, B. & HOROVITZ, S.
Clave para el reconocimiento de las variedades de ajonjolí cultivadas en Venezuela. (**Key for distinguishing the sesame varieties cultivated in Venezuela**).
Agron. trop., Venezuela 1955 : **5** : 45–49.

The varieties recently bred in Venezuela and now grown there are classified according to maturity group and according to various morphological features.

2125 MANNER, R.
Studies on seed-setting and seed yield in oil flax.
Medd. Gullåk. VäxtförädlAnst. 1956 : No. 12 : Pp. 139.

The first part of this paper is concerned with (*a*) intraplant variation in and (*b*) environmental effects on seed set and yield. Number and weight of seeds per capsule and mean seed weight were influenced by cultivation methods and manuring.

In the section on Genetical variation in seed setting and yield (pp. 67–116), the results of investigations on 17 parental lines and the F_2, F_3 and F_4 of 27 crosses among them are reported; the F_1 was not usually large enough to give statistically useful results.

On the average of all crosses, the F_2 population surpassed the better parent in numbers of capsules and seeds per plant and weight of seed per plant; gave values higher than the parental mean for height, number of flowers per plant and numbers of capsules and seeds per flower; had shorter periods from sowing to flowering and from flowering to ripening than the mean of the parents; and tended to surpass the parental mean in germination percentage. With the exception of the last character and the length of growth period, the above values decreased in successive filial generations. The different crosses differed markedly in the degree of heterosis manifested for different characters. In a comparison of the combining ability of two lines designated L and O with three other lines, L was clearly superior, showing pronounced heterosis for nearly all characters while O showed little or none. Crosses with L generally showed greater inbreeding depression in succeeding generations. Heterosis and combining ability were greater in progenies from crosses involving lines from Adoptiv or Klein 18 than in those from crosses of Atlas or Øtofte lines, while inbreeding depression was greater in progenies from crosses of Adoptiv or Atlas than in those from Øtofte. There was no significant difference in degree of heterosis between intervarietal and

intravarietal crosses, but inbreeding depression was greater in the intervarietal crosses in numbers of flowers, capsules and seeds per plant and seed weight per plant.
Highly significant correlations were observed among some characters in the degree of heterosis they showed. Highly significant correlations were also found among some characters in amount of inbreeding depression.

2126 Pandey, K. K.
Studies in autotetraploids of linseed (*Linum usitatissimum* L.). I. Growth rate.
Lloydia 1956 : **19** : 120–28.

Compared with the diploid controls, colchicine-induced tetraploids of the linseed varieties RR39, RR63 and RR68 were characterized by a lower percentage of germination, lower rate of germination, a greater height, higher total number of branches and higher rate of increase in stem diameter in investigations at the Indian Agricultural Research Institute, New Delhi. Attention is drawn to differences in growth between tetraploids of flax and linseed, as shown by the investigations of the author and other workers.

2127 Cruickshank, I. A. M.
A further note on the physiologic specialization in *Melampsora lini* (Ehrenb.) Lev. in New Zealand.
NZ J. Sci. Tech. 1956 : **38** : 85–88.

The races of *M. lini* found in New Zealand during the period 1952–55 are reclassified using the method proposed by Flor (cf. *PBA*, XXV, Abst. 1256). Fourteen physiological races, of which seven have not previously been described, are at present known in New Zealand but not all of these have appeared in any one year, nor have the same races been prominent each year. The bearing of this work on breeding for rust resistance is discussed (cf. *PBA*, XXIII, Abst. 2908).

2128 Van Steveninck, R. F. M. & Cruickshank, I. A. M.
Selection for disease resistance in linseed.
NZ J. Sci. Tech. 1956 : **38** : 239–47.

Data are provided on the response to *Melampsora lini*, *Mycosphaerella linorum* and *Polyspora lini* of varieties commonly grown in New Zealand and others introduced for breeding purposes. Variation in rust reaction was found within varieties and selection for improved resistance has been made within several varieties, including Koto, Redwood and Rocket. Data are provided on the reaction of Koto to seven races of *M. lini* and it is concluded that at least four genotypes are present, of which one provides resistance to all New Zealand rust races, and that further selection is possible. In field trials Bison and Very Pale Blue Crimped were resistant to pasmo and Calor, Uruguay F79 and Moose x NDF118 were highly resistant to browning.

2129 Cruickshank, I. A. M. & Swain, T.
Study of phenolic compounds in oil-flax (*Linum usitatissimum*).
J. exp. Bot. 1956 : **7** : 410–15.

Chlorogenic acid and an isomer of this acid were identified in Williston Golden, Ottawa 770B, Argentine Seln and Bombay. The first of these varieties is known to be susceptible to races of *Melampsora lini* as a group, the other three being resistant. Williston Golden had a high concentration of chlorogenic acid but the resistant varieties had lower concentrations. The ratio of chlorogenic acid to total phenolics was greatest in the highly resistant variety Ottawa 770B and least in Williston Golden.

2130 **Hazeldean—the first Victorian linseed.**
J. Aust. Inst. agric. Sci. 1956 : **22** : p. 220.

A new linseed variety, Hazeldean, has been released by the Victoria Department of Agriculture. It is immune to all the Australian strains of *Melampsora lini* and highly resistant to *Fusarium lini*. It is similar to Walsh in general growth characteristics, maturity and oil content but gives better yields. It was selected from the progeny of a wilt-resistant plant.

2131 **Beacon sunflower is rust resistant.**
What's New Crops Soils 1956 : **9** : No. 2 : p. 23.

A new variety of sunflower, developed in Canada and named Beacon, is described. It is resistant to *Puccinia helianthi* and under severe rust conditions will outyield Advance, but it is late maturing. Its origin is not given.

2132 Schuster, M. L.
Investigations on the foot and root phase of safflower rust.
Phytopathology 1956 : **46** : 591–95.

Varietal differences in response to infection by *Puccinia carthami* are reported in trials at the Nebraska Agricultural Experiment Station, greatest resistance being shown by N–1.

2133 Toovey, F. W. & Purvis, C.
Segregation from the *dura* x *pisifera* cross.
J. W. Afr. Inst. Oil Palm Res. 1956 : No. 4 : 106–09.

Nine different crosses between *dura* and *pisifera* palms have shown the expected 100% *tenera* offspring and the progeny of eleven other crosses include only a small percentage of aberrant types. The results of other crosses which appear inconsistent with the expected results are attributed to imperfect pollination or subsequent mixing of seed and seedlings. In three crosses between an imported Deli palm and a *pisifera* palm the progeny consisted of almost 100% *tenera* plants (cf. *PBA*, XXIV, Abst. 556).

2134 Rendements obtenus en plantation par l'utilisation de graines d'Elaeis sélectionnées à Yangambi et issues du croisement *"dura"* x *"pisifera"*. (**Plantation yields obtained by the use of *Elaeis* seeds bred at Yangambi and derived from the cross *dura* x *pisifera***).
Bull. INÉAC 1956 : **5** : 271–80.

Tabulated data are provided on oil yields obtained at the Binga Research Station from palms raised from the seed of *dura* x *pisifera* crosses effected at the Yangambi Research Station.

Report of the Wattle Research Institute, University of Natal, for 1955-1956 (1956) : Pp. 46.

2135 *Review of work in progress.* (*pp. 13–25*).
Analysis of leaf characters has continued in F_2 families and back crosses between *Acacia mollissima* and *A. decurrens* and some correlation found between pairs of characters in both F_2 and back-crossed families. Changes in correlation coefficients between number of pinnae and number of pinnules and also between other pairs of characters were found between some F_2 families from sister F_1 trees and it is suggested that these changes may be explained by changes in the linkage relations of the characters. Interspecific crosses have also been made between *A. mollissima* and *A. baileyana*, with a view to introducing cold tolerance. F_2 plants showed a wide range of recombination of characters.

Significant differences between families in the progeny trials in respect of height and incidence of gummosis and black butt are again reported. Tetraploid plants have been obtained by colchicine treatment of *A. mollissima*, *A. decurrens*, *A. dealbata* and *A. baileyana*, and many of them have a relatively thicker bark, although they show a tendency to be less vigorous than diploids.

2136 *Moffett, A. A. The black and green wattle progeny trials at Sweetwaters.* (*pp. 30–36*).
Differences between progenies in *A. mollissima* were evident when the trees were about one foot in height and gave some indication of their heights at felling ten years later. In *A. decurrens* indications of height at felling were not found until the trees were at least two years old. In *A. mollissima* correlations were found between yield of bark and percentage stand, diameter and height and between diameter at two years old and final bark yield. Only the second of these correlations was found in *A. decurrens*. The average height and diameter from planting to felling, percentage stand and stripping and the yields of the families in the trial are tabulated.

2137 MOFFETT, A. A.
Genetical studies in acacias. I. The estimation of natural crossing in black wattle.
Heredity 1956 : **10** : 57–67.

In 26 trees studied, self pollination gave consistently lower seed sets than open pollination. Segregation for recessive seedling characters occurred in both the open-pollinated and the selfed progenies from 21 of the trees. From the divergence of the segregation ratios for individual characters in open-pollinated families from the ratios for the same characters in the corresponding selfed families, the approximate degree of natural crossing was calculated and found to range from 62 to 97% with a mean of 84%. Linkage between pointed pinnules and dwarf habit was found in families from four trees, the recombination value being about 8·7%.

2138 **Report of the work of the Rubber Research Board, Ceylon, in 1955** (1956) : Pp. 135.

The breeding programme has been continued and the yields and other characters of local and imported clones for the past one to five years are tabulated; 21 local and 6 imported clones are particularly promising. The *Oidium*-resistant clone LCB870 gives very poor yields under all environmental conditions.

2139 KAWATANI, T., OHNO [ONO], T. & KINOSHITA, K.
(On colchicine-induced polyploidy in *Chrysanthemum cinerariaefolium* Bocc.).
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 49–53. [Japanese].

Colchicine-induced tetraploids were obtained. The flowers were larger and the pyrethrin content higher than in the diploids. Tetraploids and diploids did not differ in the proportion of pyrethrins I and II.

FRUITS AND NUTS

2140 Hall, J. W.
Scottish fruit trials. Second progress report—Part II—(strawberries and blackcurrants).
Scot. Agric. 1956 : **36** : 94–98.

Data are provided on the yield, length of flowering and fruiting periods and percentage of fruits attacked by *Botrytis* of Royal Sovereign and Auchincruive Climax strawberries tested at four localities in Scotland.

Five early varieties, nine mid-season varieties and three late varieties of black currant have been tested at three or four localities since 1953. Data are provided on flowering period, frost damage and yield.

2141 Gorškov, I. S.
(A summary of work done).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 2 : 51–57. [Russian].

A list is given of the varieties of apple, pear, cherry, black currant and strawberry produced by the Mičurin Central Genetical Laboratory and now in cultivation in the central belt of the Soviet Union. The varieties that have proved most successful as parents for introducing such characters as frost resistance are indicated, these being either wild species such as *Malus baccata*, *Pyrus ussuriensis* and *Vitis amurensis* or Mičurin's hybrids. Apples are now available almost the whole year round as a result of growing a range of the new varieties.

Cherries in which the content of oxidizing enzymes is high have proved the most successful pollinators.

Emphasis has been placed on the use of suitable mentors in training the hybrids and on the selection of good buds in reproducing them vegetatively, since differences in quality have been observed in vegetative progeny from different buds of the same tree.

2142 Wilhelminadorp (bij Goes) proefstation voor de fruitteelt in de volle grond. Jaarverslag 1955. [**Wilhelminadorp (near Goes) experimental station for fruit cultivation in the open. Annual report, 1955**]. Pp. 72.

The results of apple, pear and plum rootstock trials and preliminary varietal trials of apples, black and red currants, raspberries, blackberries and strawberries are included in this report from the above station (cf. *PBA*, XXVI, Abst. 2746).

2143 Gorškov, I. S.
(The second generation of Mičurin varieties).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 1 : 33–43. [Russian].

The importance attached by Mičurin to raising second and later generations of his hybrids for purposes of selection is illustrated by citations and some promising seedlings of apple, pear, cherry and plum obtained in this way are described and illustrated.

2144 Tatarincev, A. S.
(Prolonged pollen storage of fruit trees).
Priroda (Nature), Leningrad 1956 : No. 9 : p. 103. [Russian].

The pollen of apple, pear, *Sorbus* and *Crataegus* remained viable for a year at Mičurinsk, when stored in a cool room in a desiccator over calcium chloride. Pollen growth of *Sorbus* and *Crataegus* on apple and pear pistils and apple and pear pollen on *Amelanchier* was observed.

2145 Thomas, F. B.
Some effects of chemical dips on soft-fleshed fruits.
Abstr. doct. Diss. Pa. St. Univ. 1955 (1956) : **18** : 329–32.

Strawberries, red and black raspberries, cherries and peaches were treated with 3-acetyl-6-methyl-2H-pyran-2,4(3H)-dione and its sodium salt, to inhibit decay. The rate of loss of weight was reduced in all cases except peaches, where the rate of loss was increased, but some varietal differences were observed with raspberries. Respiration was inhibited in Halehaven peaches but slightly increased in Dixie Gem and Elberta.

2146 van Stuivenberg, J. H. M.
Waar komt het bij de beoordeling van een nieuw ras op aan? (**What is important in judging a new variety?**)
Fruitteelt 1957 : **47** : 16–17.

Flavour, shape, colour, yield and transportability are listed as the main criteria in assessing the merits of new apple varieties and some of the more recent varieties now grown in the Netherlands are adjudged along these lines.

2147 Nybom, N.
De tre stora i amerikansk fruktförädling. (**The big three in American fruit breeding**).
Fruktodlaren 1956 : **27** : 179–82, 191.

Among the apples most extensively used as parents for breeding in the USA are McIntosh, Delicious and Jonathan; lists of varieties derived from these three are presented. At Balsgård, Sweden, Cox's Orange, McIntosh, Jonathan and Worcester Pearmain are chiefly used.

2148 GORŠKOVA, T. A.
(Apple-pear hybrids).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 1 : 7–10. [Russian].

The hybrids described were produced by pollinating *Malus baccata* with a mixture of pollen from a number of pear varieties, after vegetative rapprochement. They are winter hardy and began to bear fruit in the 10th–11th year. They show resemblances to the pear in leaf characters, in the mauve colour of the anthers, free styles, the unpleasant scent of the flowers and the attached calyx; they are resistant to aphis and other apple pests. One of the two seedlings described bears fruits weighing 60 g. and is regarded as a useful parent for further crossing with southern varieties of pear.

2149 GORŠKOVA, T. A. & KLIMOV, P. D.
(Reducing capacity of apple-pear hybrids).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 1 : 11–12. [Russian].

The capacity to reduce KIO_3 in macerated leaves reached a maximum at the beginning of the flowering period in F_1 apple-pear hybrids and in the pear variety that served as pollen parent. In this they differed from the apple parent, in which the reducing capacity was lower and did not fall off so sharply.

In the second generation produced by pollinating the hybrids with mixed pear pollen the reducing capacity was higher than in the F_1 hybrids.

2150 BURKHOLDER, C. L.
Fenton, a promising summer apple.
Fruit Var. hort. Dig. 1956 : **11** : p. 3.

Showing promise as an early-ripening apple for southern Indiana, Fenton is regarded as superior in dessert quality to Maiden Blush, Duchess and Wealthy. Its fruits are large and bright red, with a tough waxy skin. Named after the farmer on whose land it was found by the author, the variety is under observation at a trial centre of Purdue University.

2151 STANKEVIČ, E. V.
(The characteristics of new summer varieties of apple).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 2 : 24–28. [Russian].

The sugar content at maturity was higher in some of the new varieties than in the old-fashioned variety Grušovka Moskovskaja [Moscow Pear], being 11·10% in Rozovoe Prevoshodnoe [Excellent Pink] and 10·25 in Jantarnoe [Amber]. The variety Ijuljskoe [July] was the earliest, ripening at the beginning of August, but its sugar and acid contents were rather low; those with the best keeping capacity were Koričnaja Kitaĭka [Brown Crab] and Jantarnoe.

2152 NESTEROV, JA. S.
(The question of clonal variability in fruit trees).
Agrobiologija (Agrobiology) 1956 : No. 3 : 112–13. [Russian].

Clones of the apple Beljfler Kitaĭka [Bellflower crab] from Leningrad were more vigorous and productive and had larger fruits than those from White Russia when tested at Maĭkop, but the latter were less susceptible to scab. Both kinds of clones set 2–3 times more fruits than usual after fertilization by pollen of clones from the Ukraine.

2153 THIELE, I.
Jungfernfrüchtigkeit bei Kernobst als züchterische Aufgabe. **(Production of parthenocarpic fruits in pome fruits as a breeding objective).**
Züchter 1956 : **26** : 241–43.

In experiments at the Institute for Fruit Cultivation, Dahlem, Germany, considerable varietal differences were observed in the tendency of apples and pears to set parthenocarpic fruits. The Russian apple varieties Bessemjanka [Seedless] and Slavjanka [Slav] and an early Russian crab apple referred to as Kitajka sol. ramnjaja set 14–16% parthenocarpic fruits and the French pear variety Trévoux set 47%. As the tendency to produce parthenocarpic fruits appears to be genetically determined, it is suggested that breeding for this character would prove useful in reducing yield losses due to low temperatures at the flowering stage.

2154 HULSHOF, H. J. & VAN LIER, P. J.
Invloed van de grond op de ontwikkeling van enkele appelrassen en -onderstammen. **(Influence of the soil on the development of some apple varieties and rootstocks).**
Meded. Dir. Tuinb. 1956 : **19** : 723–31.

The results of studies on the effect of soil type and soil conditions, in particular water content, on the rate of growth and yield of a number of apple varieties grown in central and northern Limburg, Netherlands, are reported.

2155 Ševčenko, V. A.
(**Apple breeding in Siberia**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 6 : 53–54. [Russian].

The size and quality of the fruit of hybrids between Siberian crab and hardy European varieties were improved by raising them on rich soil at Minusinsk, Siberia. The hybrids were as hardy as those that had been given more rigorous training on poor soil in the years preceding flowering.

2156 Kušnirenko, M. D.
(**The mentor, an effective method of directed training of hybrid plants**).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 1 : 16–20. [Russian].

Tissues of the leaves of the branches towards the top of the crown differ from those nearer the base in a number of respects, including higher suction pressure and greater drought resistance. They are expected to be more effective as mentors in training drought-resistant seedlings of apples and other fruit trees.

2157 Sedov, E. N.
(**Improving the vitality of apple hybrids**).
Agrobiologija (Agrobiology) 1956 : No. 3 : 134–36. [Russian].

Vigour, hardiness and resistance to scab of mature trees of some apple hybrids were investigated at Mičurinsk. The highest values were obtained for hybrids between large-fruited varieties and Siberian crab, in particular the hybrid of Koričnoe Polosatoe [Brown Striped] x Siberian crab. The hybrid was 100% immune from scab.

2158 Futh, G.
Erster Bericht über die Selektion von *Malus*-Unterlagen und deren vegetative Vermehrbarkeit. (**First report on the selection of *Malus* rootstocks and their vegetative propagation**).
Züchter 1956 : **26** : 248–56.

The results of trials of (*a*) the seedling progenies of open-pollinated wild *Malus* species and (*b*) hybrids between wild species are presented. The data provided include information on resistance to *Venturia inaequalis*.

2159 Walker, J. H.
Root stocks. Fruit and vegetables, producer to consumer.
FATIS Rev. 1956 : Suppl. 4–6.

This article includes a brief account of the breeding of the woolly-aphid resistant Malling Merton apple rootstocks at the East Malling Research Station and the John Innes Horticultural Institution, England. The semidwarf MM106 and the vigorous MM104, MM109 and MM111 rootstocks have been released.

2160 Guengerich, H. W. & Millikan, D. F.
Transmission of the stem pitting factor in apple.
Plant Dis. Reptr. 1956 : **40** : 934–38.

A disease causing bark splitting and wood pitting in Virginia Crab apples has been shown to be caused by a virus and is transmissible by budding and grafting. Most varieties are resistant and it is recommended that Virginia Crab be used as a test variety.

2161 Morettini, A.
La "Butirra Precoce" Morettini—incrocio Coscia x William 59/IV. (**Morettini's Early Beurré, a cross of Coscia x William 59/IV**).
Riv. Ortoflorofruttic. ital. 1956 : **40** : 359–67.

Morettini, A.
Una nuova varietà di pere estive. (**A new variety of summer pears**).
Agricoltura, Roma 1956 : **5** : No. 7 : 24–31.

After the success of the Santa Maria pear (cf. *PBA*, XXII, Abst. 1385), a second summer pear, from the reciprocal cross, has now been released. The fruit, which in form resembles that of Williams, ripens at the same time as Coscia; it is superior to Coscia in size and flavour and, being equally free from internal rotting, is expected to replace it.

2162 Kessler, H. & Stoll, K.
Versuchsergebnisse bei der Kaltlagerung von Birnensorten. (**The results of experiments on the refrigeration of pear varieties**).
Landw. Jb. Schweiz 1956 : 259–76.

A number of pear varieties grown in the German-speaking part of Switzerland were tested as to their keeping properties at low temperatures and recommendations are made as to the varieties most suitable for refrigeration. In general, a temperature of 0° C. proved the most satisfactory but some varieties failed to ripen after refrigeration at this temperature or acquired an unpleasant flavour.

2163 Černenko, S. F.
(**Production of high-quality varieties of pear for the central belt of the USSR**).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 1 : 13–15. [Russian].

Some of the hybrids produced by crossing local pear varieties or Mičurin hybrids with high-quality southern pears have survived a succession of severe winters and the best of them are classed as almost equal to the southern varieties in quality, having large fruits with a sugar content of up to 12·31% and acidity of 0·11–0·32%, weighing up to 230 g. One of them, which has been named Podarok Stoletiju [Present to the Century], a hybrid of Bessemjanka [Seedless] x Beurré Diel, is described and recommended for planting.

2164 JAKOVLEV, P. N. & OSTAPENKO, V. I.
(The results of distant hybridization of stone fruits in connexion with the activation of the oxidizing enzymes).
Agrobiologija (Agrobiology) 1956 : No. 3 : 11–14. [Russian].

Data on fruit setting and fertility of the F_1 of hybrids of *Prunus besseyi* x *P. spinosa*, *P. besseyi* x *Armeniaca vulgaris*, *P. besseyi* x *P. tomentosa*, *P. besseyi* x *P. triflora*, *P. besseyi* x *Persica vulgaris*, *P. spinosa* x *Persica vulgaris* and *P. triflora* x *Persica vulgaris* at Mičurinsk are presented and discussed in relation to the activity of the oxidizing enzymes in the leaves of the initial forms. It was found that the hybridization components were more readily compatible in crosses where the pollen parent had higher oxidase values than the seed parent. The polyphenol oxidase and peroxidase values obtained for the F_1 of all the above hybrids, the F_2 of *Prunus besseyi* x *P. spinosa* and for each species involved in the crosses are shown in a table.

2165 WELKERLING, E. M. L.
Problemas de auto-incompatibilidad sexual en variedades de almendro y damasco. **(Problems of sexual self incompatibility in varieties of almond and apricot).**
Rev. Fac. Cienc. agrar., Mendoza 1954 : **4** : No. 1 : 35–39.

All 12 varieties of almond tested failed to set fruit when bagged. Of the 18 apricots studied, all but one were self compatible.

2166 REEVES, E. L. & CHENEY, P. W.
Reaction of 39 varieties of apricots inoculated with material carrying the ring pox virus.
Phytopathology 1956 : **46** : 639–40. (Abst.).

When grafted on to infected stocks 16 apricot varieties showed symptoms of ring virus and 23 showed no symptoms, although seven of these were shown to be carriers of the virus.

2167 KARNATZ, H.
Untersuchungen über die Frostresistenz der Obstgehölze im Baumschulstadium. II. Über die relative Frosthärte unveredelter Pflaumensämlings- und Kirschunterlagen. **(Studies on the frost resistance of fruit trees in the nursery stage. II. On the relative frost resistance of ungrafted plum seedling and cherry rootstocks).**
Züchter 1956 : **26** : 178–87.

The relative frost resistance of individuals of different provenance belonging to the Formenkreise *Prunus cerasifera*, *P. domestica*, *P. mahaleb* and *P. avium* was compared by means of a mobile refrigerator plant (cf. Abst. 823). Contrary to results hitherto reported in the literature, several varieties of *P. cerasifera* proved considerably more resistant than *P. domestica*. Resistance in *P. cerasifera* appeared to be controlled by two or more genes; segregation for resistance was observed in apparently pure varieties. Hüttner 35/V/8 was the most resistant of the eight varieties of *P. domestica* tested. *P. mahaleb* proved more resistant than *P. avium*.

2168 COCHRAN, L. C.
Prune dwarf expression in plum varieties.
Phytopathology 1956 : **46** : p. 635. (Abst.).

Symptoms of infection by the prune-dwarf virus have been produced after artificial inoculation in six varieties of *Prunus domestica* but not in the fifteen varieties of *P. salicina* tested. Tragedy was the most severely infected and is recommended as a test plant.

2169 Variétés de cerises, pour la plantation et la regreffage. **(Cherry varieties for planting and regrafting).**
Courr. hort. 1956 : **18** : p. 301.

Tabulated data, prepared by the Agricultural Advisory Service of the Belgian Ministry of Agriculture, are presented on the period to maturity and size, colour, flavour and transportability of the fruit of the principal cherry varieties grown in Belgium.

2170 WILLIAMS, W. & BROWN, A. G.
Genetic response to selection in cultivated plants: gene frequencies in *Prunus avium*.
Heredity 1956 : **10** : 237–45.

A detailed account of work briefly reported in *PBA*, XXV, Absts. 2773 and 3061 is presented.

2171 KRÜMMEL, H.
Zur Sortenklärung bei Süsskirschen. (**On varietal clarification of sweet cherries**).
Dtsch. Gartenbau 1956 : **3** : 237–40.

The German varieties Büttners Rote Knorpelkirsche [Büttner's Red Cartilage cherry], Büttners Späte Rote Knorpelkirsche [Büttner's Late Red Cartilage cherry], Querfurter Königskirsche [Querfurt Royal cherry] and Altenburger Melonenkirsche [Altenburg Melon cherry] are described in detail. Differences in the growth habit of the tree, the colour and shape of the fruit and the characters of the flesh and stone by which these varieties may be distinguished from each other are indicated.

2172 GERRITSEN, C. J.
Improvement of the cherry varieties used in the Netherlands.
Euphytica, Wageningen 1956 : **5** : 101–16; Meded. Inst. Vered. TuinbGewass. 1956 : No. 83.

Work carried out in the Netherlands since 1947 includes: frequent revision of the list of recommended varieties; the establishment and identification of a collection of varieties from the Netherlands and other countries; development of an efficient and rapid pollination technique and of a method of embryo culture; the hybridization of induced tetraploids of *Prunus avium* with *P. cerasus* with the aim of obtaining new Duke cherries; the study of other interspecific and intervarietal crosses; evaluation of seedlings and unnamed varieties; and the improvement of May Duke by selection and selfing and crossing with Morello and with *P. avium.*

2173 RJABOVA, A. N.
(**The fruit setting of sweet cherry pollinated by pollen mixtures of varieties having good fertilizing properties**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 9 : 29–31. [Russian].

At the Nikita Botanical Garden, good pollinators, 2–3 for each variety, were determined and were then used separately or as components of a pollen mixture. It was found that most varieties set more fruits when fertilized by the pollen mixture than by each component separately. In some cases the fruit set obtained by the use of mixed pollen exceeded that of the one separate pollinator but was slightly below that of the other. Instances where the mode of pollination had no appreciable effect upon fruit setting were rare.

2174 KRAMER, S.
Beiträge zur Züchtungsforschung beim Pfirsich. I. Untersuchungen zur Frucht- und Embryonalentwicklung bei Pfirsichsorten *Prunus persica* (L.). [**Contributions to research on peach breeding. I. Studies on the development of fruit and embryo in peach varieties, *P. persica* (L.)**].
Arch. Gartenb. 1956 : **4** : 67–82.

A number of early, midearly and late varieties were studied to obtain information on the growth and development of the embryo and fruit and their bearing on the length of the period from fertilization to maturity of the fruit. It was found that the growth of the pericarp and the development of the embryo could be divided into three phases. In the first, which lasts 50 days, the nucellus attains its full size and the development of the embryo is inhibited. The second stage, the length of which varies considerably according to variety, is characterized by the rapid growth of the embryo and the inhibition of pericarp development. The third stage is devoted to the rapid development of the pericarp. In early-maturing varieties, the length of the second stage is always considerably less than the 40 days required to produce fully-viable embryos. These varieties do not produce viable seeds and must be propagated vegetatively and crosses in which they are used as the ♀ parent also fail to produce viable seeds.

2175 HANSEN, C. J., LOWNSBERY, B. F. & HESSE, C. O.
Nematode resistance in peaches.
Calif. Agric. 1956 : **10** : No. 9 : 5, 11.

Seedlings of Lovell, Shalil, S–37, Dwarf Hybrid 7 and 17 F_2 progeny of Bokhara x Snowball have been tested for resistance to *Meloidogyne incognita* var. *acrita* and *M. javanica.* Shalil, S–37, 28 of the 37 Dwarf Hybrid 7 seedlings and nine of the F_2 seedlings were immune or highly resistant to *M. incognita* var. *acrita*, while all the Lovell seedlings were seriously affected and were markedly stunted. No seedling was found with complete immunity to *M. javanica*, but moderate resistance was shown by Shalil, Dwarf Hybrid 7 and the F_2 hybrids, of which some clones showed greater resistance than others. Lovell was susceptible to this species also.

2176 Banfi, A. & Beñatena, H. N.
Colección de especies y variedades del género *Citrus* y afines en la Estación Experimental de Concordia. **(Collection of species and varieties of the genus *Citrus* and related genera at the Concordia Experimental Station).**
Idia 1956 : No. 101 : 42–46.

The varieties of *Citrus* and related genera maintained at the above Argentine research station are listed with notes on the more important forms.

2177 Iwasaki, T.
(On fruit drop in *Citrus*).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku Engeibu/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1956 : No. 3 : 1–16. [Japanese].

Data on the incidence of fruit drop at various stages in development of the fruit are presented for a series of Japanese varieties.

2178 Iwasaki, T., Nishiura, M. & Shichijo, T.
(Effects of 2,4-D and 2,4,5-T on fruit drop and detachment of the button in *Citrus*).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku Engeibu/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1956 : No. 3 : 17–30. [Japanese].

Varietal differences in the extent to which application of the above substances reduces fruit drop or decreases detachment of the button of the fruit are recorded.

2179 Burnaeva, N. L.
(An experiment on supplementary pollination of citrus fruits).
Agrobiologija (Agrobiology) 1956 : No. 3 : 124–28. [Russian].

At Čakvi, oranges, mandarins and lemons were supplementarily pollinated by pollen from the same plant, different plants of the same variety, different varieties of the same species and plants of other species. Tabulated evidence suggests that the last two treatments gave the highest fruit production. Plants so treated had the fewest abortive ovaries and produced larger and sweeter fruits.

2180 Soost, R. K.
Unfruitfulness in the Clementine mandarin.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 171–75.

In investigations at the University of California Citrus Experiment Station, Riverside, the mandarin Clementine proved to be self incompatible. The amounts of fruit and seed set, as well as fruit size, were increased by pollination with any of the six varieties tested, viz. the mandarins Kinnow, Honey and Tara, the tangelo Pearl, the orange Rufert and tangerine Dancy. The numbers of fruits and seeds set by Rufert were however significantly lower than those obtained from pollination by any of the other varieties.

2181 Condit, I. J. & Enderud, J.
A bibliography of the fig.
Hilgardia 1956 : **25** : 1–663.

Taxonomy, breeding, varieties, diseases and pests and processing are among the subjects covered by this extensive bibliographical list.

2182 Wheatley, S. M.
The mangoes of the Kenya coast.
E. Afr. agric. J. 1956 : **22** : 46–54.

The article includes descriptions and a classification of mango races occurring in coastal Kenya.

2183 Spencer, J. L. & Kennard, W. C.
Limited stigmatic receptivity may contribute to low fruit set in the mango (*Mangifera indica* L.).
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 287–89.

The percentage of pollen-tube penetration of the stigmas of four varieties studied in Puerto Rico was 64, 9·9, 0 and 0 when pollination was carried out in the field 3, 6, 12 and 24 hr. after flower opening, respectively. The flowers usually opened at 6·00 hr. They were protogynous, the dehiscence of the anthers being delayed until between 8·00 and 10·00 hr.

2184 Pimentel Gomes, F. & Simão, S.
Correlação entre brix e açúcar em manga. **(Correlation between brix and sugar in mangoes).**
Rev. Agric., S. Paulo 1956 : **31** : 227–33.

The relation between brix and sugar content was investigated in ten varieties. The two characters were highly correlated, the regression coefficients being practically equal for all varieties; the values of *a* in the regression equation, however, differed between varieties.

2185 Gerritsen, C. J.
Research offered new possibilities for nut growing in the Netherlands.
Euphytica, Wageningen 1956 : **5** : 139–45; Meded. Inst. Vered. TuinbGewass. 1956 : No. 84.

Selection of walnuts has been under way for some years in the Netherlands and this, together with the development of new methods of grafting under controlled conditions, has led to the production of the two approved selections, Bell and Van Toor, and one other selection, 5110, which is a suitable pollinator for both of the above and for other varieties.

2186 Šobek, J.
Výběr vlašských ořešáků. (**Selection of walnuts**).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1956 : **29** : 717–28.

Trees with good economic characteristics were selected among adapted forms from different districts of Czechoslovakia. The best selections produce large thin-shelled nuts weighing 10·50 g. and have a kernel-shell ratio of at least 48%.

2187 Šahov, A. A.
(**Mičurinist principles of plant acclimatization seen as an ecological and physiological problem**).
Agrobiologija (Agrobiology) 1956 : No. **3** : 95–106. [Russian].

Work on acclimatization of different economic plants in the USSR, based on Mičurin's theories, is surveyed. Observations on changes in the photosynthetic and respiratory activities of a hardy second generation of walnut trees which had been reproduced sexually under Moscow conditions are included.

2188 Okudai, S.
(**Studies on the resistance of *Castanea crenata* to *Dryocosmus kuriphilus*. II**).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku Engeibu/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1956 : No. **3** : 85–94. [Japanese].

Further to the studies reported in *PBA*, XXIV, Abst. 1425, the author has found that, in resistant varieties, larval penetration is followed by various types of necrotic reaction after which the larvae die.

2189 McKay, J. W.
Albino seedlings in chestnut.
Genetics 1956 : **41** : p. 653. (Abst.).

Open-pollinated seed from three trees of *Castanea mollissima* gave rise to albino seedlings in very low proportions. In crosses between the trees the frequency of albinos increased to as much as 24%, but the increase was not consistent in all crosses. Hybridization with other trees resulted in no or only very few albinos.

2190 Gorškova, T. A.
(**The greatest possible utilization of hazels in cultivation**).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 2 : 17–23. [Russian].

Figures are given showing the extent to which wild hazels and cultivated filberts occur in the various territories of the Soviet Union and the work that is being carried out to improve them by breeding. Some 2500 hybrids between local hazels and southern filbert varieties are already bearing at the Mičurin Central Genetical Laboratory and over 20,000 younger hybrids are under observation. Many of the hybrids are equal to the southern filberts in size and quality of nut while being much more frost resistant. They bear annually and some of them have up to 20 nuts per bunch.

2191 Mukherjee, S. K.
Variations in cashewnut (*Anacardium occidentale* Linn.).
Indian J. Hort. 1956 : **13** : 12–14.

Six types differing in fruit and nut characters have been distinguished in West Bengal.

2192 **New crop for the U.S.**
Agric. Res., Wash. 1956 : **5** : No. **4** : 13–14.

Several promising varieties of pistachio nuts have been developed at the US Plant Introduction Garden in California from collections made in the Near East.

2193 Shibuya, T. & Suzuki, M.
(**Physiological and morphological studies of subterranean flowering in Leguminous plants. V. The occurrence of aborted grains in the peanut**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **25** : 17–18. [Japanese].

A type of abortion of the fertilized seeds, probably due to disturbance in the nutrient supply to the young seeds, is described. Varieties of the Virginia type were more affected than varieties of the Spanish type.

2194 Evans, A. C.
A study of a rosette-resistant groundnut variety, Asirya Mwitunde.
E. Afr. agric. J. 1956 : **22** : 27–31.

On account of its tolerance of rosette, Asirya Mwitunde is the only variety now grown by the Tanganyika Agricultural Corporation in the Nachingwea area (cf. *PBA*, XXV, Abst. 511).

It is a long-season, semiupright variety with dormant seed. An account is given of investigations on the growth and flower and kernel production of the variety in comparison with Natal Common, and on the effect of spacing, fertilizers and time of harvesting on yield. After selection of the variety to eliminate undesirable morphological types, selection for yield has been carried out; one of the lines obtained has given considerably higher yields than the bulk seed.

2195 **What's new in farming.**
Indian Fmg. 1956 : **6** : No. 6 : p. 19.

Hybrid coconut seedlings have been produced from crosses between tall and dwarf palms, and have been found to have the early bearing qualities of the dwarf parent combined with the good nut and copra qualities of the tall parent.

2196 COUTINHO, L. de A.
Subsidios para o estudo cariológico da *"Olea europaea"* L. (**Notes on the caryological study of *O. europaea* L.**).
Genet. iber. 1956 : **8** : 1–26.

Cytological observations on 11 cultivated olive varieties and on *O. europaea* var. *sylvestris* showed the most common chromosome number to be $n = 23$ and $2n = 46$; certain varieties had $n = 24$ and $2n = 48$ but in all these varieties plants or forms with $2n = 46$ also occurred; thus $n = 23$ is regarded as the basic number and plants with $n = 24$ are thought to be derived forms resulting from duplication; this is borne out by their behaviour at meiosis, where univalents were frequently observed; the extra chromosome is frequently heterochromatic and shows analogies with the B chromosomes of herbaceous species.

Certain signs of stickiness, fragmentation and associated phenomena were observed also in the forms with $2n = 46$ and the species *O. europaea* is considered to be probably a segmental allopolyploid. This, together with the ease of vegetative reproduction in the species, is thought to account for the wide variation observed in the cultivated olives today.

2197 SCHMIDT DE GIL, J. & FREIXAS, A. A.
Susceptibilidad al enranciamiento de algunos aceites de oliva. (**Susceptibility to rancidity of some olive oils**).
Rev. Fac. Cienc. agrar., Mendoza 1954 : **4** : No. 2 : 15–38.

The oil of the variety Arbequina proved more prone to become rancid than that of the other two varieties, Frantoio and Criolla [Local], examined.

2198 ARNAL, H.
Eficiencia relativa de los individuos androicos y andromonoicos de *Carica papaya* L. para transmitirse por el polen. (**Relative efficiency of staminate and andromonecious individuals of *C. papaya* L. in transmission through the pollen**).
Agron. trop., Venezuela 1955 : **5** : 31–36.

Data are given showing the floral composition of the progeny from open pollination of a number of pistillate and andromonecious plants growing in the midst of a mixed population (cf. *PBA*, XXV, Abst. 1391). The progeny of the pistillate plants contained 125 staminate, 136 pistillate and 11 andromonecious plants, although the proportion of staminate to andromonecious plants in the initial population was only 5 : 57. The coefficient of efficiency of pollination in favour of the staminate plants is calculated as 129·5.

The progeny of the andromonecious plants comprised 85 staminate, 100 pistillate and 85 andromonecious plants, suggesting that the hermaphrodite flowers had all been fertilized by pollen from staminate plants.

Yearbook of the California Avocado Society, 1956 : 40 : Pp. 246.

2199 *Report of the avocado variety committee, June 2, 1956.* (*pp. 21–25*).

Notes on varieties recommended for different areas in southern California are provided.

2200 *Avocado varieties registered, January 1, 1955 to June 1, 1956.* (*pp. 26–27*).

Information is given on the main features of Amanda, Ames, Burdette, Diamond and Shepard.

2201 *Report of subtropical fruit varieties committee.* (*pp. 33–36*).

Collections of varieties and selections of several subtropical species other than citrus fruits and avocado are under observation in California.

2202 *Check-list of varieties of certain subtropical fruits.* (*pp. 43–46*).

The list gives the origin of many varieties of carissa, carob, cherimoya, mango and other fruits.

2203 *Schroeder, C. A. Cherimoyas, sapotes, and guavas in California.* (*pp. 49–56*).

Information on varieties of cherimoya, white sapote, guava, cattley (*Psidium cattleianum*) and feijoa is included.

2204 *Miller, M. P. Avocado prospects in new areas of Riverside County. (pp. 103–05).*
Notes are given on the performance of several varieties.

2205 *Hodgson, R. W. Current avocado research on the Los Angeles campus. (pp. 107–12).*
Breeding projects are among those outlined.

2206 *Boyce, A. M. Listing and description of avocado projects at University of California Citrus Experiment Station. (pp. 113–19).*
The projects described include breeding.

2207 *Delphey, C. C. Avocado prospects in Ventura County. (pp. 127–31).*
The variety situation is discussed. Hybrid avocados are among the varieties undergoing trial.

2208 *Zentmyer, G. A. & Thorn, W. A. Resistance of the Duke variety of avocado to Phytophthora root rot. (pp. 169–73).*
Duke is only moderately resistant to *Ph. cinnamomi* but may offer promising material for further selection and testing. *Persea skutchii*, *P. borbonia* and *P. donnel-smithii* are highly resistant but are incompatible with avocado scions; by hybridization it may however be possible to secure both resistance and compatibility.

2209 *Peterson, P. A. Flowering types in the avocado with relation to fruit production. (pp. 174–79).*
Varieties of the B type (cf. *PBA*, XXVI, Abst. 1763) generally give lower yields in the coastal region of California than further inland. This lower production is associated with cool coastal conditions which limit opportunity for the B type of pollination.

2210 GILLESPIE, H. L.
Gae avocado, a Fuerte mutation.
Calif. Citrogr. 1956 : **41** : 346–47.
Gae, a bud sport of Fuerte which probably originated about 20 years ago, is considered to be economically valuable on account of its quality, productive capacity and season of maturity (unspecified).

2211 BRINGHURST, R. S.
Breeding tetraploid avocados.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 251–57.

BRINGHURST, R. S.
Colchicine induced polyploidy in the avocado.
Genetics 1956 : **41** : p. 636. (Abst.).
Tetraploid clones have been obtained by treating young seedlings of the variety Mexicola and shoots of grafted scions of Fuerte with colchicine at the Department of Subtropical Horticulture, University of California, Los Angeles. Tetraploidy, as indicated by increased pollen size, was confirmed by chromosome counts ($2n = 48$) of leaf smears. The diploid pollen grains were highly viable. One of the two shoots produced by the only scion of Fuerte which flowered possessed a chimeral structure which affected not only the whole racemes but also single flowers and anthers; the other of the two shoots was nonchimerical and was used for propagation of the $4n$ condition. The possible commercial value of tetraploid avocados and their use in breeding are discussed.

2212 McKEEN, W. E.
Red stele of loganberry.
Phytopathology 1956 : **46** : p. 638. (Abst.).
The primary parasite causing red stele of loganberries is considered to be a race of *Phytophthora fragariae*, since it shows morphological and physiological similarities to *Ph. fragariae* and can infect Huxley and Baron von Solemacher strawberries but not British Sovereign.

2213 BRITTON, D. M. & HULL, J. W.
Mitotic instability in blackberry seedlings.
J. Hered. 1956 : **47** : 205–10.
Boysen and Young, both with 49 somatic chromosomes, were pollinated with Eldorado ($2n = 28$). Of the 62 progeny plants, 58 had chromosome numbers between 35 and 42 with a modal value of $2n = 38$ and four had 49–51 chromosomes. Three plants in each of the two progenies were characterized by mitotic instability resulting in varying numbers of chromosomes per cell, but were vigorous and phenotypically similar to the other hybrid plants. Cuttings from one of the unstable plants showed some mitotic instability but each had a single predominant somatic chromosome number.

2214 KUZJMIN, A. JA., ČUVAŠINA, N. P. & ŽIRONKIN, I. M.
(A tetraploid form of currant).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 10 : 23–28. [Russian].
The F_1 of a hybrid between the red currant Kyzyrgan ♀ and the black currant Davison's Eighth ♂ comprised unproductive diploid plants resembling the seed parent and triploids of the ♂ parental type, the latter interesting for high yield, large berries, long bunches and well developed seed. Among the diploids was a

plant with a branch different from all the others; it produced much larger berries than those on the rest of the plant. The abnormal branch was vegetatively reproduced and was found to be a tetraploid. It has no practical value on account of its weak growth, late bearing, uneven length of bunches and low yield. The seed progeny bred true with regard to these characteristics.

2215 Kuzjmin, A. Ja.
(The effect of the age of flower upon the compatibility of distant plant species).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **59** : 333–35. [Russian].

A pollination method facilitating the suppression of female inheritance in hybrids of red currant ♀ x black currant ♂ and red currant ♀ x gooseberry ♂ is described. The flowers of the ♀ parent were emasculated, bagged and artificially pollinated 4–6 days afterwards. By this time the female organs of the flower have passed through the stage of optimum maturity and the egg cells lost their selective capacity for self pollen.

2216 Kuzjmin, A. Ja.
(New forms of currant).
Priroda (Nature), Leningrad 1956 : No. 10 : 94–95. [Russian].

Interspecific hybrids of the Kyzyrgan red currant x Vosjmaja Devisona [Davison's Eighth] black currant from Mičurinsk are characterized by uniform maturation, large berries of even size, hardiness and resistance to shedding and *Pseudopeziza*. The selected F_2 plants produce higher quality berries than Vosjmaja Devisona, Pamjatj Mičurina [Mičurin's Memorial] and other standard varieties of black currant.

2217 Tolmačëv, N. A.
(The question of producing thornless forms of gooseberry).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 1 : 21–22. [Russian].

Thornless forms were obtained in progenies of crosses between the gooseberry Finik prostoĭ [Simple Date] and the black currant Pamjatj Mičurina [Mičurin's Memorial] carried out in 1949 and 1950. In 1955 three of the 22 seedlings bore seedless fruits, one bore fruits with the normal number of seeds and the rest were intermediate. On one bush the leaves formed in August and September were deeply dissected and differed from any leaf type known in the parent genera *Ribes* or *Grossularia*.

2218 Darrow, G. M.
Use of naphthalene acetamide in blueberry breeding.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 341–43.

In experiments at the Plant Industry Station, Beltsville, Md., during 1955, application of naphthalene acetamide (NA) to the flowers resulted in a greater number of the berries set in $6n$ x $4n$ crosses of *Vaccinium* spp. but the number of seeds showed no improvement compared with crosses made without NA. In experiments on emasculated but unpollinated plants, application of NA prevented flower abscission; growth regulators such as NA may therefore be valuable in this respect in breeding. Using NA, another group of $6n$ x $2n$ crosses was attempted, good seeds being obtained from 14 out of 19 combinations; the success of crosses of *V. constablei* and US34 (*V. ashei* x *V. constablei*) with diploid species is of particular interest.

2219 Vaughan, E. K.
A strain of *Pseudomonas syringae* pathogenic on cultivated blueberry.
Phytopathology 1956 : **46** : p. 640. (Abst.).

In cross-inoculation tests *Pseudomonas syringae* from *Vaccinium australi* and *Syringa* spp. infected both hosts, although the degree of infection was greater with inoculant from the same host genus. In agglutination tests isolates from each host reacted only with their own antiserum. It is suggested that the blueberry canker bacterium should be regarded as a distinct strain of *P. syringae*.

2220 Duka, S. H.
(Promising strawberry varieties).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 6 : 55–56. [Russian].

Kievskaja Rannjaja 2 [Kiev Early 2] (Culver x Kievskaja Rannjaja) is notable for high yield, earliness, hardiness, fine quality of fruits and resistance to fungi and drought.

2221 Verslag aardbeienrassenproef voor de vollegrond op de proeftuin te Paterswolde. **(Report on a strawberry variety trial in the open at the Paterswolde Experimental Station).**
Tuinbouwber., Groningen 1956 : **11** : 134–35.

In variety trials at the Paterswolde Experimental Station, Netherlands, Senga Sengana No. 883 (cf. *PBA*, XXV, Abst. 526) gave the highest yields, followed by Georg Soltwedel. Brief descriptions are given of these two varieties and of the others tested with them.

2222 Salamatov, M. N. & Korotaeva, M. M.
(**The strawberry at Novosibirsk**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 6 : p. 75. [Russian].

Varieties which proved productive and hardy at Novosibirsk included Sejanec Štanina [Štanin's Seedling] from Omsk and the following new varieties bred at Novosibirsk: Narodnaja [People's], 6–18 and SK14, the latter a seedling of Komsomol.

2223 **New strawberries show promise.**
Res. Frmrs., Ottawa 1956 : **1** : No. 2 : p. 12.

The varieties Ottawa 481, 483, 484 and 487 show promise for western Ontario and may shortly be named (cf. *PBA*, XXVI, Abst. 3668).

2224 Lord, W. J.
The induction of parthenocarpy and possible apomixis in the strawberry by treatments with growth regulators.
Abstr. doct. Diss. Pa. St. Univ. 1955 (1956) : **18** : 323–25.

Parthenocarpy was induced in emasculated blossoms by the application, in lanoline smears, of concentrations of about 22,000 ppm. of various growth regulators, but most of the achenes produced were small and without embryos. In a few cases embryos were produced, probably by apomixis, and gave octoploid seedlings with $2n = 56$.

2225 Liebster, G.
Untersuchungen über die Festigkeit des Fruchtfleisches und die Verletzbarkeit der Fruchthaut verschiedener Erdbeersorten. (**Studies on the firmness of the fruit flesh and the susceptibility of the fruit skin to damage in different strawberry varieties**).
Mitt. Klosterneuburg 1956 : **6** : 239–49.

An apparatus is described which enables the consistency of the flesh and the toughness of the skin to be determined with a high degree of accuracy: these two criteria are of importance in assessing the suitability of a given variety for freezing. Tabulated data, based on results obtained by this method, are presented on the suitability of a wide range of varieties for preserving. Senga 29 gave the best results, followed by Wädenswil 3, Panther and Senga 145.

2226 Shukla, K. C. & Roy, R. S.
Varietal studies of bananas under Bihar conditions.
Indian J. Hort. 1956 : **13** : 1–11.

Based on observations at the Fruit Research Station, Sabour, descriptions are given of 11 dessert and 9 culinary varieties. With respect to disease resistance, the dessert type Virupakshi and culinary varieties Bagnar and Kothia were the best.

2227 Simmonds, N. W.
A banana collecting expedition to South East Asia and the Pacific.
Trop. Agriculture, Trin. 1956 : **33** : 251–71.

An account is given of an expedition to collect new stocks of seeded and edible strains of diploid *Musa acuminata* for use in breeding in the West Indies. Promising wild strains were found in Samoa, Queensland, New Guinea and Malaya. In addition, several new species and interspecific hybrids were recognized and a large number of seed and museum collections were made.

2228 M., S.
La "190 Prosperi" presentata alla Sagra di Roma. (**190 Prosperi presented at the Rome Festival**).
G. Agric. 1956 : **66** : p. 376.

Prosperi's seedling 190 from Sabalkankoi-Regina x Italia has been named Clotilde Prosperi. It is a muscat grape with much larger fruits than Italia, maturing somewhat late in the season and is described as one of the best dessert grapes yet produced.

2229 Williams, C. F. & Underwood, V. H.
Progress in muscadine grape breeding.
Res. & Fmg. 1956 : **15** : No. **1** : p. 14.

A breeding programme is in progress at the McCullers Research Station, NC, with the aim of developing vigorous productive, disease-resistant varieties with hermaphrodite flowers. One selection is being increased for release.

2230 Santos Neto, J. R. A.
Melhoramento da videira. (**Vine breeding**).
Bragantia 1955 : **14** : 237–58.

A description is given of the methods used in vine hybridization; pollen of some varieties was kept successfully for up to 40 days in a sulphuric acid desiccator at 5° C.; pollen of *Vitis tiliaefolia* and *V. gigas* lost its viability after three weeks. Crosses have been made between a number of American grapes and high-quality European varieties; some of the hybrids have proved well adapted to conditions in Brazil and include dessert grapes, some of them with muscat flavour and ripening in different seasons, wine grapes that produce wines of acceptable quality and one seedless variety for raisins.

2231 Cosmo, I.
Gli ibridi produttori da noi ed in Francia. (**Producer hybrids with us and in France**).
Riv. Vitic. 1955 : **8** : 423–25.

In examining the position of producer hybrids and the possibility of their use in Italy (cf. *PBA*, XXIV, Abst. 643) reference is made to a list of hybrids that have been approved for cultivation in France. Certain others that have given good results in Italy, for instance Baco 1, Seibel 5455 and Seibel 10.173, are also mentioned.

2232 Di Scalea, R.
Un agricoltore-scienziato, Alberto Pirovano. (**A farmer-scientist, Alberto Pirovano**).
Agricoltura, Roma 1956 : **5** : No. 10 : 45–48.

An outline is given of the activities of this Italian geneticist in producing artificial mutants, particularly by the application of electromagnetic fields and other physical agencies, with a mention of some of the more outstanding varieties of grapes and other fruits that he has produced.

2233 Reichardt, A.
Experimentelle Untersuchungen über den Effekt von Röntgenstrahlen in der vegetativen Vermehrung einer alten Rebensorte. (**Experimental studies on the effect of X rays in the vegetative propagation of an old grape variety**).
Gartenbauwiss. 1955 : **2** : 355–413.

The growing shoots and dormant buds of the established variety Silvaner and the new varieties Mainriesling [Main Riesling] (Silvaner x Riesling) and Perle von Alzey [Alzey Pearl] (Gewürztraminer x Müller-Thurgau) were X-irradiated with doses of from 1000 to 7500 r. The new varieties were considerably more sensitive to X irradiation, both from the point of view of lethal effects and in respect of the number of mutations induced, than was the old variety Silvaner. The growing shoots were up to four times as sensitive to irradiation as the dormant buds. From the point of view of the induction of mutations, doses of 2000–4000 r. gave the most satisfactory results. Some mutations did not become evident until several years after treatment. Irradiation with weak doses led to an increase in the rate of growth but strong irradiation inhibited growth. Among the mutations obtained were chlorophyll deficiencies, changes in the morphology of the leaves and tendrils, bushy growth habit, thickened nodes, the occurrence of hairs on the growing shoot, changes in the size of the stomata, branching of the main stem, shorter or longer period to maturity and inhibition of the growing shoot. Several periclinal chimeras were also observed.

2234 Cosmo, I. & Polsinelli, M.
"Traminer aromatico".
Ann. Sper. agr. 1956 : **10** : No. 6 : Suppl. : i–viii.

The vine Traminer aromatico (= Gewürztraminer), of which several variants ascribed to mutation exist today in the Italian Tyrol and adjacent localities, is described.

2235 Del Gaudio, S. & Giusto, D.
"Pagadebito".
Ann. Sper. agr. 1956 : **10** : No. 6 : Suppl. : liii–lix.

The vine Pagadebito [Debt Payer], so named on account of its high yielding capacity, was introduced into Italy from Sicily and is described; it is suitable for wine making.

2236 Violante, C. & Ciarimboli, U.
"Fiano".
Ann. Sper. agr. 1956 : **10** : No. 6 : Suppl. : lxi–lxxi.

This vine, an ancient variety from the south of Italy, is suitable for producing light, slightly sweet white wines and excellent champagne. It is now being gradually replaced by more productive varieties which are, however, inferior in quality.

2237 Zodelava, L. N.
(**The prospects for progress in the viticulture of Abhazia**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 5 : 43–44. [Russian].

A number of high quality varieties recommended for restoration of the Abhazian vineyards are described. They are dessert, wine or dual-purpose forms, mostly old Abhazian land varieties or vines from western Georgia. Among the former Kačiči, Avasirhva and Ahardan are wine varieties and Ačkikiž a late dessert vine. Amlahu is used as a fine dessert variety and for making wine with a full harmonious flavour.

2238 Baširov, V. B.
(**The questions of progress of viticulture in the Tadžik SSR**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 5 : 22–26. [Russian].

The principal varieties of vine cultivated in

Tadžikistan are listed. Most are land races of dessert, sultana and raisin varieties, notable for their high-quality products. Among these Čiljaki, Doroī and Aušon are characterized by earliness.

2239 Levadoux, L.
Les populations sauvages et cultivées de *Vitis vinifera* L. (**Wild and cultivated populations of *V. vinifera* L.**).
Ann. Inst. nat. Rech. agron., Paris : Sér B : 1956 : **6** : 59–118.

The writer discusses the origin of European and Asiatic varieties of the cultivated vine and arrives at the conclusion that *V. sativa* is derived from *V. sylvestris*. Many of the wild vines included in *V. sylvestris* are, in their turn, descended from cultivated forms of *V. sativa*. Morphological comparisons of the leaves and seeds of a large number of wild and cultivated vines found in Europe and Asia suggest that *V. sativa* and *V. sylvestris* should be regarded as a single species, to be designated *V. vinifera*.

2240 Moskov, I. V.
(**The role of living substance in callus formation**).
Naučn. Trud. Selskostopan. Akad. Georg Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1956 : **3** : 51–65. [Bulgarian].

An amitotic mode of division in callus of *Vitis vinifera* 'Pamidy', grafted on Berlandieri x Riparia Kober 5BB, is described.

2241 Zuluaga, P. A. & Gargiulo, A.
Polyploidía en *Vitis vinifera* L. (**Polyploidy in *V. vinifera* L.**).
Rev. Fac. Cienc. agrar. Mendoza 1954 : **4** : No. 2 : 1–13.

By injection of a solution of colchicine and glycerine into young buds, a tetraploid ($2n = 76$) was obtained from the wine variety Malbeck (= Cot rogue). Four nucleoli were detectable in the somatic cells of the tetraploid at mitosis. The tetraploid bore larger leaves, flowers and fruits than the diploid. The flowers were mostly hermaphrodite but 5–10% were imperfect; these can however be mostly eliminated by clonal selection; the pollen fertility was high.

2242 **New tetraploid grape.**
Fruit Var. hort. Dig. 1956 : **11** : p. 3.

The colchicine-induced tetraploid of Loretto retains the good quality, high yielding capacity and disease resistance of the parental diploid variety and produces much larger berries and bunches.

2243 Hale, C. R. & Jones, L. T.
The pollination of Ohanez grapes.
J. Agric. W. Aust. 1956 : **5** : 565–67.

The pollen used in pollen-water sprays has been found to remain viable only for limited periods. Black Malaga pollen gives better results when pollination is carried out in this way than does Muscat pollen and remains viable for at least three hours.

2244 Filippenko, N. M.
(**Some characteristics of reproduction of the grape vine**).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 1 : 27–31. [Russian].

Some data are presented showing that the same phasic condition is required for the development of tendrils and inflorescences, from which it is concluded that the tendril and the peduncle are homologous organs.

2245 Allahverdiev, R. K.
(**The valuable vine variety Širvan Šahi**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 6 : 68–69. [Russian].

Širvan Šahi [King of Širvan], grown in the Širvan plain, is among the best wine varieties of Azerbaijan. It has medium-large bunches of black grapes and may yield up to 300 c. per ha. It is hardy and shows resistance to spring frost and drought.

2246 Kuzjmin, A. Ja.
(**New varieties of grape for the central belt of the Soviet Union**).
Bjull. central. genet. Lab. I. V. Mičurina (Bull. Mičurin cent. genet. Lab.), Mičurinsk 1956 : No. 2 : 13–16. [Russian].

Descriptions are given of three varieties: (1) Nagrada [Reward] (cf. *PBA*, XXVI, Abst. 2826); (2) Tambovskiĭ Rozovyĭ [Tambov Pink], from a cross of Malingre Seedling x Chasselas Seedling, ripens at Mičurinsk even in unfavourable seasons, exceeds its parents in frost resistance and gives a high yield of dessert grapes of a quality almost equal to that of Malingre Seedling; and (3) Tambovskiĭ Zelenyĭ [Tambov Green], from Čauš x Malengr Ranniĭ [Early Malingre], ripens at Mičurinsk in unfavourable years, equals Malingre Seedling in frost resistance and gives large yields of dessert grapes not quite equal to the preceding variety in quality.

FOREST TREES

Proceedings of the 3rd Northeastern Forest Tree Improvement Conference, Cornell University, Ithaca, New York, August 30-31, 1955 (1956) : Pp. 85.

2247 *Diller, J. D. "Screening" the American chestnut for blight resistance. (pp. 2–5).*

Some hybrids between American and Asiatic species of *Castanea* have up to now maintained their resistance to *Endothia parasitica*, but evaluation will not be complete until 25 years of field testing have been carried out.

2248 *Heimburger, C. Blister rust resistance in white pine. (pp. 6–13).*

Data are provided on the degree of infection with *Cronartium ribicola* of grafts and seedlings of *Pinus strobus*, *P. monticola*, *P. peuce* and *P. griffithii* and of two hybrids, *P. strobus* x *P. pentaphylla* and *P. strobus* x *P. peuce*. Some difference in susceptibility has been found in plants of *P. strobus* from different localities.

2249 *Santamour, F. S. Hermaphroditism in* Populus. *(pp. 28–30).*

Trees showing varying degrees of hermaphroditism have been found among populations of *P. tremuloides*, *P. sieboldii* and *P. tremuloides* x *P. adenopoda*.

2250 *Gabriel, W. J. Preliminary report on clonal differences in the wood and phloem of* Populus deltoides *and* P. trichocarpa. *(pp. 33–34).*

Details are given of anatomical differences observed between clones of *P. deltoides* and *P. trichocarpa* derived from several localities in eastern North America.

2251 *Wollerman, E. H. Strains of black locust resistant to borer. (pp. 35–38).*

Data are presented showing the percentage survival and average diameter of 11 clones of *Robinia pseudacacia* planted in 1940 at Zanesville, Ohio, as part of an investigation of resistance to *Cyllene robiniae*. Strain HC–4051 shows 93% survival, the highest recorded, and an average diameter of 5·5 inches, the second highest recorded.

2252 *Mergen, F. How much forest tree improvement can we expect from genetical methods. (pp. 48–54).*

The author discusses his subject under the headings: (1) multiplication of existing superior germ plasm, (2) combination of desirable traits already existing in various individuals of the same species or in individuals of different species and (3) development of new types (genotypes) with the aid of mutagenic agents, and concludes that considerable improvement would result from work along these lines.

2253 *Giddings, E. L. Application of genetical methods in the spruce-fir type from the view point of the forest manager. (pp. 63–64).*

McLintock, T. F. Forest tree improvement in the spruce-fir region. (pp. 65–77).

These contributions stress the need for further research to overcome the difficulties of identifying plus trees at an early age and of distinguishing between the influences of inherited and environmental factors on the growth and development of trees.

2254 Matthews, J. D.

Breeding improved forest trees.

Agric. Rev., London 1956 : **2** : 39–41.

A popular account is given of improvement of forest trees by selection of superior individuals for vegetative multiplication or seed production, by hybridization to exploit hybrid vigour, and by polyploidization, examples being given from work in Gt. Britain and other countries.

2255 Syrach Larsen, C.

Selection of stands and single trees for seed production and breeding, by means of general inventory—original species and exotics.

12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/1 C; FAO/56/5/3255 : 1956 : Pp. 4. (Mimeographed).

The importance of preserving the best stands and single trees of forest-tree species for seed production and breeding is discussed along general lines.

2256 Schröck, O.

Problematik bei der Anwendung von Frühtesten in der Forstpflanzenzüchtung. (**Problems in the application of juvenile tests in forest-tree breeding**).

Züchter 1956 : **26** : 270–76.

After stressing the importance of assessing growth capacity, disease resistance and photoperiodic response in seedlings at as early a stage as possible, the author discusses the comparative merits and reliability of tests of rate of seedling development and studies of annual growth increments in forecasting the genetical potentialities of a given individual. It is pointed out that care must be taken to ensure that the results obtained from such tests are not prejudiced by unfavourable environmental conditions, including day length, at the locality at which the test is conducted. Forest trees differ from crop plants in that individual differences in the development of the different ontogenetic stages are of particular importance in selecting individuals for breeding purposes.

2257 MACDONALD, J.
International Union of Forest Research Organizations: Congress in Oxford.
Nature, Lond. 1956 : **178** : 730–32.

A short account is given of the twelfth congress of the above union, held in Oxford during July 1956. One section dealt with the selection of stands and single trees for seed production and breeding.

2258 MATTHEWS, J. D.
The survey of seed sources and plus trees in Britain.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/8; FAO/56/4/2525 : 1956 : Pp. 10. (Mimeographed).

An account is given of the aims and methods used in registering seed sources and plus trees of forest species in Britain. Seed sources are classified as plus, almost plus and normal. Plus and almost plus sources are being converted by removal of all badly shaped trees into plus seed stands which, if their value is confirmed by progeny tests, will be called élite seed stands. Similarly plus trees will be termed élite trees after progeny testing. Grafts or cuttings of plus trees are being established in one or more tree banks which together will eventually form a national collection of plus trees for breeding.

2259 WETTSTEIN, W.
Report for section 22.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/9; FAO/56/4/2526 : 1956 : Pp. 1. (Mimeographed).

A brief report of forest-tree improvement at the Research Institute of Forestry, Maribrunn, is presented. Both indigenous conifers and hardwood species are being subjected to individual selection and progeny testing. Attention is drawn to the importance of not only the usual comparison of trees of different provenance but also of investigating the influence of thermoperiodic and photoperiodic factors on the growth of young trees from various sites and altitudinal zones. The survey to locate stands for seed production and plus trees throughout Austria has been completed.

2260 ALJBENSKIĬ, A. V.
(New hybrids of trees).
Les. Hoz. (Forestry) 1956 : No. 9 : 15–19. [Russian].

This report on interspecific hybridization on deciduous forest trees at Kamyšin mentions new forms of maple, poplar, aspen and elm, mainly distinguished by leaf and flower characteristics. Some maple hybrids come into fruiting early and grow tall. *Populus alba* x *P. bolleana* and other poplar hybrids show good trunk and girth increments. Many elm hybrids are also notable for vigorous growth and show resistance to drought and soil salinity.

2261 HAGMAN, M.
Racial inventory of forests in Finland and the use of material in forest tree improvement.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/20; FAO/56/4/2535 : 1956 : Pp. 9. (Mimeographed).

Work on the selection of plus trees and plus stands of forest-tree species in Finland during the past decade is outlined. Selected material has been propagated by grafting for use in breeding and to establish seed orchards. Since the orchards will not produce seed for some time, plus stands are at present being used for seed supplies.

2262 Det norske Skogforsøksvesens virksomhet 1955–56. **(The activities of the Norwegian Forest Research Institute, 1955-56).**
Norsk Skogbruk 1956 : **2** : 623–30.

Work on forest-tree breeding has included the following: the survey and assessment of stands and trees of spruce as sources of breeding material and seed; progeny trials of spruce and fir of differing provenance; the propagation of spruce by means of cuttings; the establishment and extension of arboreta containing native and foreign breeding material and the planting of seed orchards.

2263 Vestlandets forstlige forsøksstasjon. Beretning for 1955–56. **(The Forest Research Station of the West. Report for 1955-56).**
Norsk Skogbruk 1956 : **2** : 763–64.

Forestry research in western Norway has included the establishment of new provenance trials of larch, spruce and Douglas fir. Among older larch trials, some provenance types have shown good frost resistance and others resistance to *Chermes abietis*. Day length has been shown to have a decisive effect upon the development of complete winter hardiness in Japanese larch.

2264 Ny genetisk avdelning vid skogsforskningen. **(New genetical department in forestry research).**
Skogen 1956 : No. 20 : 558–59.

The opening of the new genetics building of the

Swedish State Forestry Research Institute on 26 September 1956 is reported. Its work is to include research on selection methods, on vegetative propagation of hybrids and on the effects of genotype upon qualitative and quantitative characters.

2265 Søegaard, B.
Selection of stands and single trees for seed production and breeding by means of general inventory in Denmark.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/19; FAO/56/4/2534 : 1956 : Pp. 3. (Mimeographed).

An outline is given of the improvement of indigenous and exotic forest-tree species in Denmark by selection of (1) stands for seed production and (2) single trees and stands for breeding purposes and the establishment of seed gardens.

2266 van Soest, J.
Inventory work for selection and tree breeding purposes in the Netherlands.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/3; FAO/56/4/2521 : 1956 : Pp. 1. (Mimeographed).

Ways in which selection of stands for seed production and of plus trees has been accomplished in the Netherlands as a means of improving both coniferous and deciduous species are briefly described.

2267 Houtzagers, G. & van Straaten, L. E.
Organization of forest tree improvement in the Netherlands and research on vegetative propagation at the Institute for Forest Research of the Agricultural University, Wageningen.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/5; FAO/56/4/2523 : 1956 : Pp. 3. (Mimeographed).

The activities of the Stichting ter Verbetering van Voortkwekingsmateriaal van Houtopstanden [Foundation for Improvement of Basic Breeding Materials for Forest Stands], established in 1952 to coordinate improvement of forest and road-side trees in the Netherlands, are described. A progress report is included of research being carried out on methods of vegetative propagation of selections of conifers and deciduous species at the Institute of Forestry Research, Wageningen, in cooperation with the foundation.

2268 Hyun, S. K.
Forest tree breeding in Korea.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/21; FAO/56/4/2536 : 1956 : Pp. 10. (Mimeographed).

Compared with *Pinus rigida*, hybrids of *P. rigida* x *P. taeda* show much more rapid growth and a better form; they are at the same time as cold resistant as *P. rigida*. Mass production of seed of this combination is under way. Another hybrid showing promise with respect to rapidity of growth and cold resistance is *P. rigida* x *P. radiata*.

Interspecific and intraspecific hybridization of *Populus* has been carried out to take advantage of hybrid vigour. *P. monilifera* x *P. maximowiczii* and the reciprocal have displayed a high degree of heterotic vigour. Selection of superior individuals among the F_1 of this combination and their propagation are under way.

Tetraploidy has been induced by seed treatment with colchicine in species of *Pinus*, *Populus* and other genera, with the aim of producing triploids from $4n$ x $2n$ crosses. In the case of large seeds with hard coats and thick endosperm, such as those of *Pinus koraiensis*, treatment of excised embryos with colchicine is recommended.

Plus stands of *Pinus densiflora* possessing a straight and narrow-crowned form have been selected along the eastern coast for seed production. Selection of plus trees and establishment of seed orchards of this form are to be carried out.

In connexion with the breeding programme on *Pinus* and other genera, the development of techniques for rooting and grafting is receiving attention.

2269 Hellinga, G.
On forest tree improvement in Indonesia.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/101 : 1956 : Pp. 3. (Mimeographed).

Breeding in Indonesia is still in the preliminary stages. The first investigations, such as provenance trials and study of flowering and fruiting, to be carried out in connexion with improvement were restricted to *Tectona grandis*, but since the second world war *Acacia decurrens*, *Pinus merkusii*, *Agathis loranthifolia* and *Melaleuca leucadendron* have been included in the programme of improvement at the Forestry Research Institute, Bogor. Methods of vegetative propagation have been tested. Since the bottle-grafting method has proved successful with *P. merkusii*, work on improvement of this species can be initiated; different types are distinguishable and require to be investigated with respect to their hereditary characters. Spiral growth in *A. loranthifolia* appears to be heritable. Two types of *M. leucadendron* exist: the Buru type with an oil content of 0·83% in the leaves and the Timor type with an oil content of 0·41%. The cineol content of the oil is respectively 61·3% and 69·1%. Split grafting succeeds with this species. Plus trees of *T. grandis* have been selected from natural stands; buddings of such trees have been established for seed production and clonal comparison of the mother trees. Vegetative propagation of *A. decurrens* by various methods was almost completely unsuccessful; the seed of selected trees were therefore used to establish a special plantation.

2270 Dorman, K. W.
Genetics in relation to forest management.
Ames For. 1956 : **43** : 17–19.

In this popular account the author shows how knowledge of variation and heredity may aid the forester in selecting trees as producers of seed for artificial or natural regeneration and in carrying out intermediate fellings.

2271 Chiarugi, A.
Citogenetica forestale. (**Forest cytogenetics**).
Ann. Accad. ital. Sci. for. 1955 : **3** : 27–77.

In this lecture the speaker explained the importance of a knowledge of genetics for research in most modern biological sciences, including that of forestry; it is mentioned that the relatively high chromosome number of most forest trees makes for greater ease of recombination of characters than in the average herbaceous species; this together with mutation provides the material for selection. It is pointed out that geographical rather than genetical isolation has been responsible for speciation in a great number of tree genera, which have also retained a high degree of uniformity in their chromosomal features. Examples quoted are *Platanus occidentalis* and *P. orientalis*, *Fagus sylvatica* and *F. grandiflora*, *Cedrus libanitica* and *C. atlantica*, the American *Cupressus* spp., the genera *Cupressus* and *Chamaecyparis* and many species of *Larix*, *Rhododendron*, *Robinia*, *Populus* and *Salix*, which intercross easily, giving fertile hybrids and simple segregation. The role of introgression in speciation is illustrated by examples from *Acer*, *Crataegus*, *Pinus*, *Abies*, *Fagus*, *Juniperus* and other genera; others serve as examples of clinal variation. The role of chromosome reorganization is illustrated by species of *Campsis*, *Cytisus*, *Populus*, *Pseudotsuga*, *Pseudolarix*, *Sciadopitys*, the Cycadaceae and Ericaceae and the genus *Pyrola*. Polyploidy is considered to be the most important chromosome change involved in speciation; examples of autopolyploidy are given in *Carpinus betulus*, *Robinia hispida*, *R. boyntonii* and the giant *Populus tremula* in Sweden; examples of artificial autopolyploids by the triploid elms, birches and oaks in Sweden; the difficulty of obtaining polyploid conifers is also mentioned. A long list of genera in which allopolyploids have been found is given, special mention being made of *Aesculus carnea*, *Prunus domestica*, *Salix cinerea*, *S. laurina* and the subfamily Oleoideae of the Oleaceae, in which the number $n = 23$ is regarded as derived by alloploidy, from individuals with $n = 11$ and $n = 12$ respectively, on lines analogous with those established for the Pomoideae; in the same way other groups such as the Platanaceae ($x = 21$), the Salicaceae ($x = 19$), the Monochlamydeae ($x = 14$) and the Fagaceae ($x = 12$) are all considered to be allopolyploids, the diploid progenitors of which have disappeared in the course of ages.

2272 Gustafsson, Å. & Simak, M.
X-ray diagnostics and seed quality in forestry.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/102 : 1956 : Pp. 10. (Mimeographed).

Investigations carried out at the Forest Research Institute, Stockholm, on the application of X-ray photography in relation to problems of seed quality are surveyed (cf. *PBA*, XXVI, Abst. 1827). The results of X-ray diagnosis of embryo and endosperm quality are being used in the selection of plus trees and in the development of ecotypes adapted to arctic conditions.

2273 Barner, H.
Aktuella proveniensfrågor. (**Current problems concerning provenance**).
Svenska SkogsvFören. Tidskr. 1956 : **54** : 201–04.

Arnborg, T.
Aktuella proveniensfrågor. (**Current problems concerning provenance**).
Skogen 1956 : **43** : p. 30.

The desirability and possibility of devising a uniform system of describing the provenance of forest-tree seed imported into Scandinavian countries are discussed. The minimum data required are latitude, longitude and altitude, but information on climate and length of growing season is also regarded as desirable.

2274 Bouvarel, P.
Les dangers d'abâtardissement des peuplements de grande valeur: mesures de conservation. (**The dangers of contamination of populations of great value. Conservation measures**).
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/106 : 1956 : Pp. 7. (Mimeographed).

The introduction of seed of different provenance has resulted in hybridization between indigenous and introduced material in a number of valuable oak, pine and spruce forests in France and consequently to a deterioration in the quality of the timber they produce. It is suggested that, in future, the introduction of seed of outside provenance should be prohibited and the areas already contaminated should be mapped and felled as soon as possible.

2275 Brünig, E.
Über die Wirkung des Hexachlorcyclohexanes auf die Mitose und das Streckungswachstum in der Wurzel einiger Koniferen. (**On the effect of hexachlorocyclohexane in mitosis and growth of root tips in some conifers**).
Z. Forstgen. Forstpflanzenz. 1953 : **2** : 113–17.

The effect of the above substance on mitosis and growth of root tips in *Pinus sylvestris*, *Pseudotsuga taxifolia*, *Larix leptolepis* and *Picea abies* was shown to be similar to that of colchicine and other c-mitotic substances.

2276 Klem, G. G.
Åpent brev til skogstreforedlerne i Norden. (**Open letter to the forest tree breeders in Scandinavia**).
Norsk Skogbruk 1956 : No. 21 : p. 710.

The desirability of selecting plus trees of coniferous species mainly on the basis of tree form and rate of growth is questioned. Since most of the softwood grown is used in the pulp industry and since the amount of pulp produced is proportional to the dry matter content, it is suggested that dry matter content, which may vary considerably from tree to tree, should also receive attention in selection. It is pointed out that several investigations have shown that rapid growth may result in an increase in lignin content at the expense of the cellulose which is more important in pulp production.

2277 Langner, W.
Möglichkeiten der Saatgutgewinnung von züchterisch geprüften Einzelbäumen. (**Possibilities in the production of seed from genetically-tested individual trees**).
Züchter 1956 : **26** : 276–78.

The author points out that when young plus trees that have been raised from controlled crosses and are now undergoing trials have reached the stage where they can be used for the production of seed, a technical reorientation will be required in the layout of seed nurseries. With this object in view, a number of layouts are discussed which would ensure adequate cross pollination and the best possible combinations. A certain degree of self sterility in the parent trees is a prerequisite for the success of such seed nurseries.

2278 Schmitt, R.
Aufbau der Forstpflanzenzüchtung in Hessen. (**Establishment of forest-tree breeding in Hesse**).
Züchter 1956 : **26** : 278–85.

Selection of plus trees of pine, larch and Douglas fir with a view to using grafted material from them for setting up seed nurseries in the state of Hesse, Germany, is outlined. As elsewhere in Germany, the planting of seed from other ecological areas for reafforestation purposes in previous decades has resulted in the introduction of a considerable amount of undesirable material, so that the need for replanting with élite trees genetically adapted to this area is urgent. A number of suitable sites for the setting up of seed nurseries have been planted. The results of preliminary studies on the range of pollen dispersal are also mentioned (cf. *PBA*, XXVI, Abst. 1829).

2279 Morandini, R.
Le contrôle de l'origine des semences forestières en Italie. (**Controlling the origin of forest-tree seed in Italy**).
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/17; FAO 56/4/2532 : 1956 : Pp. 6. (Mimeographed).

The criteria employed in selecting plus trees of *Pinus* spp., *Abies alba*, *Cupressus sempervirens*, *Picea excelsa*, *Larix decidua*, *Cedrus atlantica* and *Pseudotsuga taxifolia* var. *viridis* are outlined and work in Italy on locating and mapping suitable stands for seed production is described.

2280 GATHY, P. E. J. N.
État actuel des recherches et travaux de génétique forestière à la Station de recherches des Eaux et Forêts, Groenendaal-Hoeilaart. (**Present state of research work on the genetics of forest trees at the Groenendaal-Hoeilaart station for research on waterways and forests**).
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/10; FAO/56/4/2527 : 1956 : Pp. 2. (Mimeographed).

The work of the Groenendaal-Hoeilaart Station in compiling a register of plus stands of forest trees in Belgium is outlined. Seed orchards of *Pinus* spp., *Picea abies*, *Pseudotsuga taxifolia*, *Larix leptolepis*, *L. europaea*, *Fagus sylvatica* and *Quercus* spp. have been established at the station.

2281 LANGNER, W.
Die Klonanordnung in Samenplantagen. (**The arrangement of clones in seed orchards**).
Z. Forstgen. Forstpflanzenz. 1953 : **2** : 119–21.

Complete randomization is advised. A suitable distribution of ten clones with ten plants in each clone can be obtained, using either a rectangular or staggered row layout. However, at least in theory, the staggered layout has certain advantages. Proposals are made for suitable mixtures of various numbers of clones.

2282 LANGNER, W.
Förderung von Zuchtbaumselektionen in den natürlichen Verbreitungsgebieten forstlich bedeutungsvoller Holzarten. (**Promotion of selections of pedigree trees of important forest-tree species in their natural areas of distribution**).
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/6; FAO/56/4/2806 : 1956 : Pp. 3. (Mimeographed).

Work at the Schmalenbeck Forestry Institute, Germany, on the conservation of land races containing valuable genetical material is outlined, with special reference to larch, pine and spruce. In addition to maintaining seed orchards, the institute is endeavouring to preserve stands of élite trees in their native habitats.

2283 STERN, K.
Rassenbildung und Bestandesanerkennung. (**Race formation and recognition of forest-tree stands**).
Züchter 1956 : **26** : 285–87.

The substance of this article has been summarized in *PBA*, XXVI, Abst. 3801.

2284 PEACE, T. R.
International cooperation in the investigation of tree disease resistance and susceptibility.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/24/22; FAO/56/4/2685 : 1956 : Pp. 3. (Mimeographed).

The collation and analysis of the information already available in the literature on forest-tree reactions to diseases in individual countries are suggested as a preliminary to the extension of inoculation experiments on a more international basis and the establishment of plantations in areas exposed to natural infection.

2285 SCHÜTT, P.
Forstschutz durch Züchtung. (**Forest protection through breeding**).
Umschau 1956 : **56** : 617–20.

The topics discussed in this popular article include: methods of breeding; some results obtained through breeding pines for resistance to *Cronartium ribicola* and chestnut for resistance to *Endothia parasitica*; morphological and physiological causes of resistance to pests and diseases in various trees; and selection for hardiness.

2286 HEPTING, G. H.
Forest disease research in the south.
J. For. 1956 : **54** : 656–60.

It is mentioned that white pines and black currants resistant to blister rust (*Cronartium ribicola*) are undergoing tests in the southern USA. Resistance to little leaf (*Phytophthora cinnamomi*) in *Pinus echinata* and *P. taeda* appears to be heritable. Chestnut hybrids between blight-resistant Asiatic species and susceptible American species with desirable form and nut quality are being developed.

2287 CORTI, R.
Ricerche sul ciclo riproduttivo di specie del genere *Quercus* della flora italiana. I. Osservazioni sul ciclo riproduttivo in *Quercus coccifera* L. II. Contributo alla biologia ed alla sistematica di *Quercus suber* L. e in particolare delle forme a sviluppo biennale della ghianda. (**Researches on the reproductive cycle of species of the genus *Quercus* in the Italian flora. I. Observations on the reproductive cycle of *Q. coccifera* L. II. Contribution to the biology and the systematics of *Q. suber* L. and in particular the forms with biennial development of the acorns**).
Ann. Accad. ital. Sci. for. 1954 : **2** : 235–64; 1955 : **4** : 55–133.

In part I observations on the floral biology of *Q. coccifera* in Italy are reported.

In the second part the literature on *Q. suber* is reviewed and personal observations on these oaks in Italy, France and Morocco are reported, from which it is shown that two biotypes exist, an annual and a biennial, which are not distinguishable on morphological features. The floral biology in each biotype is described and it is concluded that the biennial type, which has been classed by some authors as *Q. occidentalis*, does not merit specific rank and can be considered as a subspecies of *Q. suber*; many of the forms described as botanical varieties are regarded as genetic mutants, the existence of which is connected with the antiquity of the species.

2288 Pospíšil, J.
Šlechtění osiky. (**Breeding the aspen**).
Sborn. vysoké Škol. zeměd. les. Brně 1955 : **4** : 191–95.

Mention is made of interspecific hybridization of poplars at Brno. Material distinguished by rapid growth was obtained by intercrossing *P. tremula* forms from different districts.

2289 Muhle Larsen, C.
Le rôle des stomates dans la description des races et des clones d'arbres forestiers. (**The role of the stomata in the description of races and clones of forest trees**).
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/104 : 1956 : Pp. 3. (Mimeographed).

A method of distinguishing between different races and clones of forest trees by counting the number of stomata per given area and measuring the length of the stomata is described, with special reference to *Populus* spp.

2290 Sauer, E.
Stachelähnliche Bildungen bei einem Bastard zwischen zwei Balsampappeln. (**Thorn-like formations in a hybrid between two balsam poplars**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 103–04.

One of the five F_1 plants obtained at the Würtemburg Forestry Experimental Station, Stuttgart-Weil, Germany, from a cross between *Populus candicans* ♀ and *P. trichocarpa* ♂ differed from both parent species in the shape of the leaf and in having thorn-like outgrowths along the stem. It is thought likely that these outgrowths in the hybrid are due to an interaction between certain genes of the *P. candicans* and *P. trichocarpa* genomes.

2291 Schönbach, H.
Untersuchungen über Cellulosegehalt und Raumgewicht von Pappelhölzern im Rahmen der Züchtung. (**Studies on cellulose content and cubic weight in poplar timbers in connexion with breeding**).
Wiss. Abh. dtsch. Akad. LandwWiss. Berlin 1956 : No. 16 : 1–32.

When samples were taken from living trees by means of an increment borer, considerable differences in cellulose content were found between trees belonging to the same stand. Marked variations were, however, observed in different parts of the trunk, so that several samples were necessary to assess the average cellulose content of a given tree. An increase in cellulose content with age was observed, the rate of increase varying in different species, strains and provenance types. The most rapid rate of increase in cellulose content was observed between the second and fourth years of growth; after the fourth year, selection for above-average cellulose content proved practicable and a number of élite individuals were selected on the basis of results obtained from increment borings. Most of these élite trees pertained to *Populus berolinensis*, although some clones resulting from crosses between *P. trichocarpa* and *P. berolinensis* also possessed high cellulose contents. Genetically determined differences in volume weight were also observed.

2292 Marcet, E.
Die Phänologie als Bestimmungsmerkmal bei Pappelsorten. (**Phenology as a characteristic for the identification of poplar varieties**).
Ber. schweiz. bot. Ges. 1956 : **66** : 5–18.

Morphological criteria for distinguishing different cultivars, provenance types and hybrids are provided. Root development, time of flushing and rate of growth of the shoots also proved of value for identification purposes.

2293 Kantor, J.
Generativní hybridisace břízy. (**Sexual hybridization of the birch**).
Sborn. vysoké Škol. zeměd. les. Brně 1955 : **4** : p. 236.

Breeding work at Brno with *Betula alba* and wide crossing involving this species as the female and *B. latifolia*, *B. fastigiata*, *B. glandu-*

lifera and *B. papyrifera* as the pollen parent are mentioned.

2294 Schulenburg, G. A. Fr. v. d.
Problem beträffande proveniensfrågor hos pionjärträd. (**Problems concerning questions of provenance in pioneer trees**).
Svenska SkogsvFören. Tidskr. 1955 : **53** : 411–15.

This is a report of a paper read at the Eighth International Botanical Congress, Paris (cf. *PBA*, XXV, Abst. 3433).

2295 Holmes, C. H.
Plantations and provenance trials of teak in Ceylon.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56 : 1956 : Pp. 2. (Mimeographed).

Seed of Indian origin has in general given better results as regards both early survival and subsequent growth than seed of Burmese origin in the drier coastal regions of the Eastern Province of Ceylon.

2296 Roy, R. P. & Jha, R. P.
Cytological studies in *Shorea robusta* Roxb.
Sci. & Cult. 1956 : **22** : 236–38.

S. robusta was found to have a chromosome number of $2n = 14$ and to be meiotically regular. No cytological differences between the so-called white and red strains grown in Bihar were observed.

2297 Pryor, L. D., Chattaway, M. M. & Kloot, N. H.
The inheritance of wood and bark characters in *Eucalyptus*.
Aust. J. Bot. 1956 : **4** : 216–39.

A study of the progeny obtained from trees within hybrid swarms of *E. robertsoni* x *E. rossii* and *E. elaeophora* x *E. maculosa* and from trees of the parent species indicated that the structure of the bark and wood and the physical and mechanical properties of the wood depend upon multiple factors.

2298 **Eucalypts for planting.**
FAO For. Stud. 1955 : No. 11 : Pp. 403.

This publication includes sections on the eucalypts in Australia, experience with the eucalypts as exotics in various countries, the adaptability of different species to cold and aridity, utilization, systematics, synonyms, and the characteristics of the species most used for planting.

2299 Gerasimov, M. V.
(**Interesting facts from the work on acclimatization of *Eucalyptus* species**).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 229–36. [Russian].

This account of acclimatization of *Eucalyptus* in the Transcarpathian province of the Ukraine mentions forms that proved tolerant of — 30° C.

2300 Contardi, H. G.
Variabilidad en *Eucaliptus rostrata*. (**Variability in *E. rostaata***).
Rev. Fac. Cienc. agrar., Mendoza 1954 : **4** : No. 1 : p. 47.

Marked differences between trees were noted in respect of tolerance of drought, saltpetre and low temperature.

2301 Miki, S. & Hikita, S.
(**Inferences as to the chromosome number of Japanese fossil plants pertaining to *Metasequoia* and *Sequoia***).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1950 : **63** : 119–24. [Japanese].

The size of the stomata and epidermal cells of Japanese Tertiary fossils of these genera corresponds with those of extant plants whence it is inferred that the chromosome numbers also correspond.

2302 Hyun, S. K.
Report on the section of stands and single trees for seed production and breeding, by means of general inventory—original species and exotics. Proposal for topics for the next congress: mass production of hybrid seed.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/2; FAO/56/4/2520 : 1956 : Pp. 2. (Mimeographed).

The author refers to the establishment of plus stands of *Pinus densiflora* f. *erecta* along the eastern coast of South Korea. Selection of plus trees of *P. rigida* has also been initiated in South Korea for reproductive purposes.

2303 Thulin, I. J.
Comments on research in teak: proposals regarding other species: selection for seed production and breeding: proposals for topics for the next congress.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/4; FAO/56/4/2522 : 1956 : Pp. 2. (Mimeographed).

A short report of forest-tree improvement in

New Zealand is included. Stands of exotic species have been chosen as seed sources. At present selection is confined to *Pinus radiata*. The author suggests that *Pseudotsuga taxifolia* and *Pinus contorta* should be subjected to international provenance tests which should include seed sources west of the Cascade-Sierra mountains and cover the complete latitudinal range of the species. He also suggests that the pines of Mexico should be discussed at the next congress of the International Union of Forest Research Organizations, since that country contains a high number of species, varieties and geographical races.

2304 McWilliam, J. R. & Florence, R. G.
The improvement in quality of slash pine plantations by means of selection and cross breeding.
Aust. For. 1955 : **19** : 8–12.

This article includes a summary of the results of tests carried out on progeny from single-tree selections and from controlled crosses of *Pinus elliottii*, in the Beewah district of Queensland. Differences between progenies were greatest in respect of stem straightness although differences in crown quality were also observed, particularly among the controlled-cross progeny. Twice the number of acceptable stems per acre were obtained from the progeny of seed from selected trees and four times the number from the progeny of controlled crosses, as compared with unselected plots. Recommendations are made in the light of these results for a tree improvement programme.

2305 Magini, E.
Expériences de génétique sur les pins méditerranéens. (**Genetical experiments on Mediterranean pines**).
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/(107) : 1956 : Pp. 6. (Mimeographed).

Some of the seedlings from the cross *P. pinaster* x *P. hamiltonii* displayed hybrid vigour in crossing experiments carried out at the Institute of Forestry, Florence, Italy. Crosses were also carried out between *P. pinea* and *P. halepensis*, *P. pinea* and *P. pinaster* and *P. halepensis* and *P. pinaster* but no viable seeds were obtained. A number of intraspecific crosses were effected between plus trees of these species. The inheritance of the character soft testa in *P. pinea* var. *fragilis* was studied in crosses with other species. Studies were carried out on the floral biology of *Pinus* spp. and on pollen dispersal.

2306 Mergen, F.
Selection and breeding of slash and longleaf pine at Lake City, Florida.
Z. Forstgen. Forstpflanzenz. 1953 : **2** : 126–29.

A brief summary is given of work at the Southeastern Forest Experiment Station, Lake City, Fla., on breeding *Pinus elliottii* (cf. *PBA*, XXVI, Abst. 1828) and *P. palustris* (cf. *PBA*, XXVI, Absts. 3815 and 3836) for improved yields of resin, rapid juvenile growth and disease resistance. Good results have been achieved by pedigree and mass selection and by hybridization between these two species and with *P. taeda*.

2307 Nilsson, B.
Kvalitets- och produktionsförhållanden i ett klonförsök av tall. (**Conditions affecting quality and yield in a clonal trial of pine**).
Svenska SkogsvFören. Tidskr. 1956 : **54** : 61–74.

A summary of this paper from another source appeared in *PBA*, XXVI, Abst. 3822.

2308 Andersson, E.
"Kvalitets- och produktionsförhållanden i ett klonförsök med tall". (**"Conditions affecting quality and yield in a clonal trial of pine"**).
Svenska SkogsvFören. Tidskr. 1956 : **54** : 209–10.

The work and conclusions of Nilsson, abstracted in *PBA*, XXVI, Abst. 3822, are criticized on the grounds that, since (*a*) the trials were carried out on uneven land, (*b*) the scions varied in age, (*c*) the root stocks were not uniform, (*d*) the number of scions per clone varied and (*e*) no control plots or replications were studied, no reliable conclusions on the effect of genotype upon quality can be drawn from the experiment.

2309 Johnsson, H., Persson, A. & Eriksson, G.
Tallens rastyper i Sydsverige. (**Racial types of pine in southern Sweden**).
Svenska SkogsvFören. Tidskr. 1956 : **54** : 47–60.

The paper has been summarized from another source in *PBA*, XXVI, Abst. 3832.

2310 Wieser, R. F.
Alpine Kiefern-Rassen. (**Alpine pine races**).
Allg. Forstztg. 1956 : **67** : 199–200.

Two main races, with broad crowns and long branches and with narrow crowns and short branches respectively, are distinguished and described. The former is more resistant to heavy snowfalls and damage by wind but the branches of the latter possess a greater elasticity. The author draws attention to the dangers of negative selection caused by indiscriminate felling and urges that the forestry authorities in the Austrian Tyrol take measures to counteract this tendency.

2311 Schröck, O.
Die Ermittlung des individuellen Wachstumganges von Einzelbäumen für Samenproduktion und Züchtung. (**Estimating the individual course of growth of single trees for seed production and breeding**).
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/16; FAO/56/4/2807 : 1956 : Pp. 3. (Mimeographed).

It was found possible to assess the value of individual pines as seed parents in breeding for rapid juvenile growth by determining the growth rate of seedlings from controlled pollinations during the first few weeks of their development (cf. *PBA*, XXIII, Abst. 3006) and by studying the growth rate and growth habit of grafted cuttings in the nursery.

2312 Kiellander, C. L.
Some aspects of the English names of *Picea abies* (L.) Karst. and *Pinus sylvestris* L.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/14; FAO/56/4/2531 : 1956 : Pp. 2. (Mimeographed).

European spruce, European pine and black pine are proposed as English names for *Picea abies*, *Pinus sylvestris* and *Pinus nigra* respectively. It is further suggested that the names of European spruce and European pine may be shortened to spruce and pine when no mistake is possible.

2313 Florence, R. G. & McWilliam, J. R.
The influence of spacing on seed production.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 97–102.

The results of studies in Queensland, Australia, to determine the influence of spacing on cone production in seed orchards of plus trees of *Pinus elliottii* var. *elliottii*, *P. taeda* and *Araucaria cunninghamii* are reported. Maximum cone production per tree was achieved when the tree was under conditions of free growth but maximum cone production per acre necessitated a closer spacing. An optimal spacing of 24 ft. x 24 ft. is suggested for all three species; closer stocking results in a decrease in cone production per acre and a marked reduction in the size of the cones.

2314 Walter, H. J.
Variation in sensitivity to atmospheric fluorides among Ponderosa pine seedlings.
Phytopathology 1956 : **46** : p. 637. (Abst.).

A wide range in sensitivity to atmospheric fluorides has been found among seedlings of *Pinus ponderosa* near Spokane, Washington, some plants giving a consistent response over a four year period and others fluctuating in their reaction. Differences between plants could not be explained on the basis of exposure differences, soil moisture, soil fertility or date of bud elongation.

2315 Henry, B. W. & Bereaw, T. E.
Shortleaf-loblolly hybrid pines free of fusiform rust after 5 years' exposure.
J. For. 1956 : **54** : p. 779.

Thirty-one hybrids between *Pinus echinata* (♀), which is resistant to *Cronartium fusiforme*, and the susceptible species *P. taeda* (♂) were free from cankers after growing next to infected trees for five years.

2316 Bingham, R. T., Squillace, A. E. & Patton, R. F.
Vigor, disease resistance, and field performance in juvenile progenies of the hybrid *Pinus monticola* Dougl. x *Pinus strobus* L.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 104–12.

Selections of *P. monticola* and *P. strobus* comparatively resistant to blister rust (*Cronartium ribicola*) were crossed and their juvenile progenies, consisting of 16 families, were evaluated in respect of growth rate, vigour and resistance to *C. ribicola*. The hybrid progenies varied considerably in growth rate but, in general, grew more rapidly than either parent species or the progenies of intraspecific crosses involving either *P. monticola* or *P. strobus*. This superiority was due partly to earlier germination and in some cases tended to decrease in the third and fourth years of growth. The rate of growth of the fastest-growing hybrid progenies was

60–100% greater in the first four years than that of the progenies of intraspecific crosses. A positive correlation was established between the growth rates of individual hybrid progenies and the growth rates of progenies of intraspecific crosses involving the same parents; selection of parents on the basis of the superior growth rate of their intraspecific progenies would thus be effective in improving the juvenile growth rates of interspecific hybrid progenies. On the basis of preliminary observations, the faster-growing hybrids appeared to be more susceptible to *C. ribicola* than the progenies of intraspecific crosses but some hybrid progenies were more resistant than others and selection for improved resistance in the hybrids should prove possible. A comparison of the growth rates of the interspecific hybrids and of the two parent species at Spokane, Wash., and Wisconsin Rapids, Wis., suggested that certain clones of *P. monticola* and *P. strobus* possess gene combinations enabling them to make more effective use of the growing season at a particular locality. These gene combinations were inherited by some of the hybrid progenies. In observation plots in northern Idaho and northwestern Montana, many of the hybrids suffered considerable damage from heavy snowfalls owing to their spindly growth. The hybrids appeared to be intermediate between the two parents in respect of their ability to remain erect and withstand injuries caused by heavy falls of snow and their possible acclimatization in the Rocky Mountains or Wisconsin remains doubtful.

2317 KIELLANDER, C. L.
En beaktansvärd granproveniens. (**A noteworthy spruce provenance**).
Svenska SkogsvFören. Tidskr. 1956 : **54** : 275–89.

A stand of Continent spruce at Boserup, Skåne, and the progenies from crosses involving trees from this stand contained a higher proportion of trees which had late-opening buds and which were more resistant to spring frosts than other stands, the offspring from several crosses of one mother tree being particularly late. The height and diameter of Boserup progenies in different districts were greater than those of native or other Continent spruces of the same ages, tested in the same areas. The origin of the Boserup spruce is uncertain but it is thought to come from the Mecklenburg area, Germany. It is suggested that seed plantations of this spruce should be established in southern Swedish provinces where resistance to spring frost is desirable.

2318 GATHY, P. E. J. M.
Observations sur la disjonction des caractères de *Larix eurolepis* à la F_2. (**Observations on the segregation of characters in the F_2 of *L. eurolepis***).
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/11; FAO/56/4/2528 : 1956 : Pp. 6. (Mimeographed).

The morphological and anatomical characteristics of F_2 hybrids between *L. decidua* and *L. leptolepis* from Clifton and Dunkeld, Great Britain and from Wagelwater, Belgium, were studied. On the average, 48% of the hybrids resembled *L. decidua*, 7% *L. leptolepis* and 45% were intermediate between the two parent species. Many of the hybrids displayed hybrid vigour. Some of the hybrids from Wagelwater proved highly resistant to *Coleophora laricella*.

2319 GOTHE, H.
Ein Kreuzungsversuch mit *Larix europaea* D.C., Herkunft Schlitz und *Larix leptolepis* Gord. 2. Mitteilung. (**A crossing experiment with *L. europaea* D.C., Schlitz provenance, and *L. leptolepis* Gord. Second report**).
Z. Forstgen. Forstpflanzenz. 1953 : **2** : 122–25.

Mortality due to frost after the first-year growth was 55% in *L. leptolepis* x *L. leptolepis*, 12% in *L. leptolepis* x *L. decidua*, 20% in *L. decidua* x *L. leptolepis* and 3·5% in *L. decidua* x *L. decidua*. The superior growth rate of the hybrids was maintained in the second year. No significant relationship could be established between climatic conditions and the cyle of annual growth of the hybrids. There appear to be inherent differences in the growth cycle between the cross *L. decidua* x *L. decidua* and *L. decidua* x *L. leptolepis* on the one hand and *L. leptolepis* x *L. leptolepis* and *L. leptolepis* x *L. decidua* on the other.

2320 GOTHE, H.
Ein Kreuzungsversuch mit *Larix europaea* D.C., Herkunft Schlitz, und *Larix leptolepis* Gord. 3. Mitteilung. (**A crossing experiment with *L. europaea* D.C., Schlitz provenance, and *L. leptolepis* Gord. Third report**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 116–25.

The hybrids *L. eurolepis* and *L. lepteuropaea* obtained from the cross *L. europaea* x *L. leptolepis* and its reciprocal (cf. *PBA*, XXIII, Abst. 694) continued to display heterosis in the third and fourth years of growth and both hybrid groups were superior to the two parent species in height and diameter of the trunk. It was shown that variations between the species and hybrids in respect of growth habit and growth rate and in reaction to climatic conditions in the first four years of growth were genetically determined.

2321 Gøhrn, V.
Proveniensforsøg med lærk. (**Provenance trials with larch**).
Forstl. Forsøgsv. Danm. 1956 : **23** : 1–124.

Details are given of the results of provenance trials carried out in nine experimental areas in Denmark. The origins of the tested trees were as follows: *Larix decidua* from the Alps, Scotland, Norway, Sweden, Denmark, Czechoslovakia and Poland; *L. gmelini* from Korea; *L. leptolepis* from Japan; *L. leptolepis* x *L. decidua* bred in Denmark; and *L. sibirica* from Archangel.

2322 Morandini, R.
Expériences internationales sur les races du mélèze (1944). Notes sur les premiers résultats obtenus en Italie. [**International experiments on larch races (1944). Notes on the first results obtained in Italy**].
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/18; FAO/56/4/2533 : 1956 : Pp. 7. (Mimeographed).

Data on rate of growth, morphological characters of the growing tree and cone production are presented for races of larch from Switzerland, Austria, Czechoslovakia, Poland and Germany introduced into the Italian Alps in 1944. The best results were obtained from a race from Hrottwitz in Moravia. Provenance types from Schlobitten, East Prussia, and Blümbach, Austria, also displayed a good rate of growth.

2323 Baldwin, H. I.
The period of height growth in different provenances of European larch.
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/15; FAO/56/4/2556 : 1956 : Pp. 8. (Mimeographed).

Weekly measurements of the increase in height of young trees of *Larix europaea* during 1954 and 1955 at Hilesboro, New Hampshire, failed to disclose noteworthy differences in the growth period of trees originating from different countries.

2324 Illies, Z. M.
Veränderungen der Pollengrösse bei Lärche nach Blütenbehandlung mit Colchicin. (**Changes in the size of larch pollen after treatment of the flowers with colchicine**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 112–15.

Giant diploid and mixoploid pollen grains were obtained at the Forestry Institute, Schmalenbeck, Western Germany, by treating flower buds with a 0·2% solution of warm colchicine. The treatment, which was carried out in a partial vacuum (cf. *PBA*, XXV, Abst. 1367), proved most effective when given during diakinesis. The possible value of this technique in shortening the period necessary to obtain polyploid larches is indicated briefly.

2325 Galoux, A.
Considérations phytogéographiques et variabilité génétique du douglas. (*Pseudotsuga taxifolia*). [**Phytogeographical considerations and genetical variability of the Douglas fir (*Ps. taxifolia*)**].
12th Cong. internat. Un. For. Res. Org.; IUFRO 56/22/103 : 1956 : Pp. 9. (Mimeographed).

The author attempts to define the principal races of *Ps. taxifolia* in the west of the North American continent with reference to phytogeographical areas and discusses the effect of natural selection on the evolution of these races. The different provenance types are listed and their comparative suitability for introduction into western Europe and their potential value as breeding material are discussed.

VEGETABLES

2326 Philp, J. & Horne, F. R.
Breeding and testing of improved varieties of vegetables. Fruit and vegetables, producer to consumer.
FATIS Rev. 1956 : Suppl. 6–10.

After a brief description of the procedures employed at the National Vegetable Research Station and the National Institute of Agricultural Botany, England, in (*a*) testing existing varieties for trueness to type or synonymy and (*b*) determining their short-comings in yield, quality, disease resistance and season of production, information is provided on current breeding projects on Brussels sprouts, cabbage, cauliflower, lettuce, beetroot and other vegetables. The article concludes with an outline of seed-production methods.

2327 Pal, B. P., Sikka, S. M. & Singh, H. B.
Improved Pusa vegetables.
Indian J. Hort. 1956 : **13** : 64–73.

Varieties of sweet potato, onion, cauliflower, water melon, *Luffa* spp., bottle gourd, tomato, egg plant, pea, cowpea, guar (*Cyamopsis psoralioides*) and okra, recommended as the result of tests at the Indian Agricultural Research Institute, New Delhi, are described. The varieties consist of introductions or selections from indigenous and foreign material.

2328 **New vegetable varieties. List III.**
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 587–609.

A further descriptive list is given of varieties of vegetables introduced in North America since 1936 by official institutions, trade organizations and private individuals (cf. *PBA*, XXVI, Abst. 1838).

2329 Philipp, F.
Ergebnisse der Frühgemüsesortenversuche 1955, II. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of trials of early vegetable varieties, 1955, II. (In connexion with the Commission for the Austrian Book of Cultivated Varieties)**].
Mitt. Klosterneuburg 1956 : **6** : 192–208.

The results of trials of new varieties of early lettuce, cabbage and cauliflower are presented.

2330 **A new carrot variety for the home gardener.**
NZ J. Agric. 1956 : **93** : 489–90.

A garden variety of carrot, named Sweetcrop, has been developed and released by the Crop Research Division of the Department of Scientific and Industrial Research at Lincoln, New Zealand, by selection from Holmes Improved. The roots are shorter and darker in colour than those of Holmes Improved and are of good flavour and texture. The variety is recommended for home gardening as it yields well and is resistant to aphids.

2331 Paci, P.
Ricerche sulla biologia fiorale della carota. (**Research on the floral biology of the carrot**).
Riv. Ortoflorofruttic. ital. 1956 : **40** : 414–23.

A description is given of the floral organs of the cultivated carrot and of observations made on the course of anthesis and on fertilization in a number of typical varieties. Very few achenes were formed parthenocarpically when emasculated flowers were bagged without pollination or by selfing when flowers were bagged without either emasculation or artificial pollination. Application of self pollen to emasculated flowers produced a set of 36%, which was roughly the same as that obtained from pollen of other cultivars or of wild carrots. All these must therefore be excluded from the vicinity of plots of carrot designed for seed production or breeding work.

2332 Atkin, J. D.
Bitter flavor in carrots. II. Progress report on field and storage experiments.
Bull. NY St. agric. Exp. Sta. 1956 : No. 774 : Pp. 30.

This detailed report of investigations on factors which may cause bitterness of stored carrots refers to the possibility of breeding for freedom from this defect (cf. *PBA*, XXVI, Abst. 1844).

2333 Banga, O. & van Bennekom, J. L.
Praktijkproeven met ronde witpunt radijs 1953–1954. (**Field trials of round, white-tipped radishes, 1953-54**).
Meded. Inst. Vered. TuinbGewass. 1956 : No. 76 : 301–14.

More than 50 selections were tested in 14 commercial trials in different parts of the Netherlands and classified into 6 groups on the basis of the size of the tops and the colour pattern of the roots. Data on yield, maturity, uniformity, flavour and resistance to sponginess and cracking are provided.

2334 Krickl, M.
Die Züchtung von nicht pelzig werdenden Radieschen und Rettigen. (**Breeding radishes that do not become spongy**).
Mitt. Klosterneuburg 1956 : **6** : 269–81.

It was found possible to test the degree of sponginess in potential seed plants by cutting a portion from the side of the growing radish. Selection by this method over several generations resulted in the development of lines with a reduced tendency to sponginess from several of the better-known radish varieties cultivated in Austria; complete elimination of this defect does not, however, appear to be possible. Selection of plants with a reduced tendency towards bolting was also successfully carried out at the same time.

2335 Ustimenko, G. V.
(**Jerusalem artichokes in the Non-chernozem Belt**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. 1956 : No. 5 : 26–30. [Russian].

The article mentions Saratov 1 and Kievskiĭ Belyĭ [White Kiev] which formerly outyielded all other varieties grown for forage in Moscow province. But in recent years hybrids between Jerusalem artichoke and the sunflower have proved even more productive than these. In particular, hybrids 15 and 120 from Odessa produce large amounts of green matter and tubers.

2336 Löhrke, L.
Über die Wirkung verschiedener Standweiten, Düngungen und Erntetermine auf den Ertrag und die Bestockung von Topinambursorten und -stämmen. II. Beiträge zur Züchtung und zum Anbau der Topinambur, *Helianthus tuberosus* L. **(On the effect of different spacings, fertilizer applications and times of harvesting on the yield and number of stems of varieties and strains of Jerusalem artichoke. II. Contributions to the breeding and the cultivation of the Jerusalem artichoke, *H. tuberosus* L.).**
Z. Acker- u. PflBau. 1956 : **102** : 101–21.

Varietal differences in reaction to applications of nitrogen fertilizer and to different spacings are noted; these differences were usually small. The number of stems produced varied considerably according to variety and the amount of fertilizer applied also exercised an influence (cf. *PBA*, XXVI, Abst. 3859).

2337 Plaisted, R. L.
Onion field plot technique.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 390–97.

A uniformity trial using the variety Melzer Yellow Globe indicated an optimum plot size of four 5′ rows.

In a comparative trial of onion varieties and hybrids, the best technique for securing a uniform stand was to plant excess seed and thin to a uniform number of plants or to an exact spacing. Intervarietal differences tended to have less effect on yield than environmental conditions at the time of parental seed production.

2338 Sharma, A. K. & Roy, M.
Irradiation. Its effect on young metabolic nuclei and phosphatase activity in plants.
Cellule 1956 : **57** : 335–54.

Bulbs of *Allium cepa* were subjected to X irradiation at the rate of 80 r. per minute, total doses of 250 r. and 1000 r. being given. The effect of a dose of 250 r. was to bring about a gradual homogeneity in cobalt-sulphide precipitation throughout the nucleus and cytoplasm, as opposed to the normal differential precipitation between nucleus and cytoplasm in the case of nonirradiated cells. Phosphatase activity was inhibited immediately after irradiation but, as the cells gradually recovered from the effects of the X rays, normal phosphatase activity was resumed. Recovery was more rapid at low temperatures than at high temperatures and fewer chromosome fragments were observed, a feature that is thought to be due to the greater stickiness at the lower temperatures resulting in the broken ends being joined more rapidly. Damage caused by irradiation with a dose of 1000 r. was considerably greater than that caused by 250 r. and in the former case the changes brought about in the chemical composition of the cytoplasm were much greater than those caused to the nucleus. Changes in the colloidal composition of the nucleus resulting from irradiation are discussed. Cells irradiated at different stages during the resting phase, at a temperature of 32° C., showed the same amount of chromosome fragmentation, which suggests that the broken ends can remain as disunited parts for a considerable period.

2339 **New onion variety for south.**
Seed World 1956 : **79** : No. 6 : p. 40.

The high-yielding hybrid White Granex has been developed at the Texas Agricultural Experiment Station. Except for its white bulbs and later maturity, it resembles Granex (cf. *PBA*, XXIII, Abst. 1520).

2340 **Hybrid onion developed.**
Colo. Fm. Home Res. 1956 : **7** : No. 2 : p. 8.

New hybrid onion developed for Western Slope growers.
Colo. A & M News 1956 : **11** : No. 5 : p. 8.

The F_1 hybrid onion Pilot, suitable for western Colorado, is superior to Mountain Danvers in yield, storage quality and appearance.

2341 Jones, H. A., Perry, B. A. & Leeper, P. W.
White Granex: A mild high-yield onion hybrid.
Sth. Seedsman 1956 : **19** : No. 10 : 20–21.

A white onion hybrid, White Granex, has been developed for use in the southern states (cf. *PBA*, XXVII, Abst. 917). It matures later and gives slightly lower yields than Granex, but higher yields than Eclipse, and is moderately resistant to *Pyrenochaeta terrestris*. It comes from a cross between a male sterile line, L303, selected from Eclipse, and line B1410 from

Winter Haven 56 (Texas Early Grano 951 x Crystal Grano).

2342 Kurita, M.
(The chromosome morphology of tetraploid *Allium nipponicum*).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1947 : **60** : 37–38. [Japanese].

A description is given of the morphology of each of the 8 chromosomes in the genome of the above species. The observations were made on a colchicine-induced tetraploid.

2343 Kato, Y.
Descriptive and experimental cytology in *Allium*. III. Deficiency of satellites in the nucleolar chromosomes.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 9–14.

A. fistulosum 'Wakeginebuka' is heterozygous for the presence of the satellite of the nucleolar chromosome. Some plants of the variety Kujo are homozygous for its absence. Observations suggesting that the satellite might disappear through fragmentation are reported. Pyrogallol causes random, not localized, chromosome fragmentation in this species.

2344 Thompson, A. E.
What to expect from new asparagus varieties.
Canner 1955 : **121** : No. 4 : 11–12.

This article briefly describes the breeding of asparagus in Illinois, with special reference to breeding for resistance to *Puccinia asparagi*.

2345 Savčenko, N. A.
(Improving the vitality of white-headed cabbage).
Agrobiologija (Agrobiology) 1956 : No. 3 : 23–27. [Russian].

Work on the improvement of the former standard Zavadovskaja at Vorošilovgrad involved Mičurinist training, selection and intravarietal hybridization of different provenance types of this variety. The new form, Zavadovskaja VSHI [Zavadovskaja Vorošilovgrad Agricultural Institute], outyields the standard and Braunschweig [Brunswick], forms larger heads than these and is less susceptible to bacterial rot on irrigated land. It has a lower percentage of plants that fail to form heads and its dry matter and sugar contents are higher. Mention is also made of a high-yielding family, selected among the same material, which has been designated Vorošilovgrad 7.

2346 Shibata, K.
(Self and cross incompatibility in autotetraploid *Brassica pekinensis*. II. Genetic analysis of individuals from secondary crosses).
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 22–29. [Japanese].

The following additional information on compatibility relations in 4*x* strains is given: $S_1S_1S_1S_1$ x $S_1S_1S_2S_2$, $S_1S_1S_1S_1$ x $S_1S_1S_4S_4$ and $S_1S_1S_4S_4$ x $S_1S_1S_3S_3$, compatible; $S_aS_aS_aS_b$ x $S_aS_aS_aS_a$, incompatible; $S_aS_aS_aS_b$ x $S_bS_bS_bS_b$ and $S_aS_aS_aS_b$ x $S_cS_cS_cS_c$, compatible; S_aS_a, S_bS_b and S_cS_c pollen on $S_aS_bS_cS_c$, incompatible; and $S_1S_1S_1S_2$ and $S_1S_2S_3S_3$ selfed, incompatible (cf. *PBA*, XXVI, Abst. 2889).

2347 Håkansson, A.
Seed development of *Brassica oleracea* and *B. rapa* after certain reciprocal pollinations.
Hereditas, Lund 1956 : **42** : 373–96.

Seed development of *B. oleracea*, as represented by kale, and of *B. rapa* showed some minor differences. After intraspecific crosses between diploids and autotetraploids, endosperm development was severely disturbed. Embryo development was less abnormal but became slow and was usually interrupted. After 2*n* x 4*n* pollinations, the endosperm remained noncellular for a prolonged period. In kale crosses of this type, the endosperm frequently contained an excessive amount of cytoplasm, a considerable number of enlarged nuclei being formed, whereas in 2*n* x 4*n* turnip crosses the endosperm contained less cytoplasm and the increase in nuclear size began later and was less frequent. After 4*n* x 2*n* crosses, the ovules increased in size more slowly than in 4*n* x 4*n* and 2*n* x 2*n* combinations; the volume of the endosperm was small but cell formation occurred earlier than in the two last-mentioned types of pollination. The 4*n* x 2*n* kale crosses produced some seeds with a mature embryo differing in appearance from that of the normal embryo; only one such seed was obtained from the reciprocals. In turnip crosses between diploid and tetraploids, the failure of the chalazal end of the embryo sac to widen and the consequent separation of this region from the basal endosperm may explain the unexpected abortion of all the embryos. In interspecific crosses of kale and *B. rapa*, at both the diploid and tetraploid levels, mature hybrid embryos were very rarely formed; marked reciprocal differences in the abnormal development of the embryo and endosperm were observed. Embryo abortion in the various crosses is probably due to the endosperm deficiency caused by disturbed nutritional relations between the endosperm and surrounding sporophytic tissue of the ovule.

2348 Crocomo, O. J. & Salibe, A. A.
Conteúdo em cálcio, proteina e vitamina C em doze variedades de couve (*Brassica oleracea*). **II. [Content of calcium, protein and vitamin C in twelve varieties of cabbage (*B. oleracea*). II].**
Rev. Agric., S. Paulo 1956 : **31** : 189–206.

Further observations on the twelve cabbage varieties (cf. Abst. 920) showed that in nitrogen content all varieties were equal. The highest vitamin C content was recorded in variety 4, with 227·395 mg. %, which was significantly higher than variety 9 with 147·302 mg. %.

2349 Squibbs, F. L.
The frequency of occurrence of "off-type" plants in savoy seed stocks.
J. nat. Inst. agric. Bot. 1956 : **7** : 634–38.

The examination of seed stocks reported in *PBA*, XXIII, Abst. 3041 has been continued. This report gives the total percentages of off-type plants found in trials at four centres in 1953, including hybrids, admixtures, bolters and rosettes.

2350 Atkin, J. D. & Natti, J. J.
Yellows-resistant large Glory kraut cabbage is on the way.
Fm. Res. 1956 : **22** : No. **4** : p. 7.

This popular article describes the incorporation of resistance to *Fusarium oxysporum* f. *conglutinans* into Reed's Improved Glory, at Ithaca, NY, using a back-cross technique.

2351 Thompson, K. F.
Production of haploid plants of marrow-stem kale.
Nature, Lond. 1956 : **178** : p. 748.

In *Brassica oleracea* var. *acephala* glabrousness of the first leaf is recessive to hairiness and depends upon a single gene. Out of 2674 seedlings obtained at the Cambridge Plant Breeding Institute, England, by pollinating five S_1 plants homozygous for the recessive gene with an S_1 plant homozygous for the dominant gene, a glabrous first leaf was found in four plants, two of which proved to be haploids ($2n = 9$). Of the 54 cells examined at metaphase I, 38 had no bivalents, 12 had one and the remainder two; these observations are briefly discussed in connexion with the problem of the basic chromosome number of *Brassica*.

2352 Finch, C. G.
Winter cauliflower trials in the south-west; Nos. 4 and 5 periods: 1949/50-1953/54.
J. nat. Inst. agric. Bot. 1956 : **7** : 624–33.

Data are provided on the maturity, yields of perfect, marketable imperfect and unmarketable heads and head size of 13 varieties together with comments on their frost and disease resistance and habits of growth.

2353 Natti, J. J. & Atkin, J. D.
Susceptibility of broccoli and cauliflower to cabbage-yellows.
Fm. Res. 1956 : **22** : No. **4** : p. 6.

Varieties of cauliflower and broccoli have been tested at Geneva, NY, for their reaction to *Fusarium oxysporum* f. *conglutinans*. Calabrese, DeCicco and Waltham 29 broccoli and Early Purple Head cauliflower were completely resistant and Early Green Sprouting and Midway broccoli and Early Snowball cauliflower were only slightly infected.

2354 Sampson, D. R.
Genetics of self-incompatibility in broccoli.
Genetics 1956 : **41** : p. 659. (Abst.).

Investigations at the Central Experimental Farm, Ottawa, indicated that self incompatibility in *Brassica oleracea* var. *italica* is determined by multiple oppositional alleles at locus *S*. Pollen reaction is sporophytically determined. Analysis of heterozygotes for four *S* alleles indicated the occurrence of independent, dominant and incompletely dominant types of genic interaction.

2355 Sen, S.
Cytological analysis of a claimed varietal hybrid of *Brassica oleracea* L.
Bull. bot. Soc. Bengal 1955 : **9** : 17–21.

Both Italian broccoli and a putative hybrid ($2n = 18$) between this parent and the cauliflower exhibited a high number of meiotic irregularities, such as univalents, multivalents and various abnormalities in chromosome separation. In the broccoli and the hybrid, 48·8% and 53·3% respectively of the cells divided irregularly. Pollen sterility in the latter was 43·2%.

2356 Buck, P. A.
Origin and taxonomy of broccoli.
Econ. Bot. 1956 : **10** : 250–53.

A brief account is given of the development of cultivated varieties of sprouting broccoli and other cultivated species of *Brassica*.

2357 JONES, H. A.
Hybrid vegetables of tomorrow.
Seed World 1956 : **79** : No. 5 : p. 14.

In the third and final article of this series (cf. Absts. 916–17), progress in breeding hybrid spinach at Texas Agricultural Experiment Station is surveyed, mention being made of the recently developed Early Hybrid 7 (cf. *PBA*, XXVI, Abst. 1854) and the closely similar Early Hybrid 10.

2358 THOMPSON, A. E.
The extent of hybrid vigor in spinach.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 440–44.

Twelve F_1 hybrids were compared with eight monecious inbreds and three standard varieties with respect to yield at the University of Illinois. Only two of the inbreds were involved in the parentage of the F_1 hybrids. The average yield of the hybrids surpassed that of the varieties by 20·1% and 16·3% in the first and second harvests respectively, and that of the inbreds by even higher percentages. Differences in the performance of the hybrids were mostly attributable to disparities in male parentage. Lines inbred for three generations gave lower yields than lines inbred for two generations.

2359 HUHNKE, W., MONICKE, W., SCHWANITZ, F. & SENGBUSCH, R. v.
Beiträge zur Qualitätszüchtung bei Nahrungs- und Futterpflanzen. I. Grundlagen für die Züchtung von oxalatarmem Spinat. (**Contributions to breeding for quality in food and fodder plants. I. Bases for the breeding of spinach with a low oxalate content**).
Züchter 1956 : **26** : 168–72.

The oxalate content of spinach leaves may be determined by growing the plants in soil heavily fertilized with calcium nitrate and subsequently exposing the macerated leaves to polarized light, when the calcium oxalate crystals they contain are clearly visible and enable the comparative oxalate content to be determined. Using this method, spinach plants with a low oxalate content were selected in the seedling stage at the Max Planck Institute for Breeding Research, Hamburg-Volksdorf. Approximately one plant per thousand of those examined proved deficient in oxalate and some of the seedlings so selected retained this deficiency throughout their subsequent vegetative growth. They are now being crossed to determine whether this property is genetically determined. Studies of mangel, sugar beet and beetroot revealed that the leaves of these plants also contain considerable amounts of oxalate. Breeding for a reduced oxalate content in these crops is advocated in view of the danger to cattle fed with such leaves.

2360 HONČARIV, R.
Příspěvek k poznání diferenciace pohlaví u dvoudomých rostlin. (**A study of sexual differentiation in diecious plants**).
Preslia 1956 : **28** : 216–20.

Data showing negative correlation between high pH and rH values of the pollen and large size of pollen grains in *Spinacia oleracea* are presented. High pH and rH values are thought to indicate male-type grains and low values female-type grains.

2361 RODENBURG, C. M.
Het kweken van wolfresistente spinazierassen. (**Breeding spinach varieties resistant to downy mildew**).
Zaadbelangen 1956 : **10** : 325–26.

The technique employed at the Wageningen Horticultural Institute, Netherlands, in testing spinach seedlings for resistance to *Peronospora effusa* is outlined. A number of lines combining resistance to *P. effusa* with resistance to low temperatures and rapid juvenile growth have been obtained.

2362 AXELSSON, F.
Drivsallat Weibulls 185. (**The forcing lettuce Weibulls 185**).
Weibulls Allehanda 1956 : No. 2 : 16–17.

Weibulls 185 is suitable for cultivation in autumn or winter. It resembles Cheshunt Early Giant in its large firm heads but matures earlier.

2363 VLČEK, F., TOUL, V. & POSPÍŠILOVÁ, J.
Obsah L-askorbové kyseliny v rychleném salátě. (**L-ascorbic acid content in forced lettuce**).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1956 : **29** : 795–808.

Král Maje [May King] had the highest vitamin content among the forcing varieties at Olomouc and was also the most productive.

2364 LINDQVIST, K.
Reflexed and erect involucre in *Lactuca*.
Hereditas, Lund 1956 : **42** : 436–42.

The erect condition of the involucral bracts at maturity in *L. sativa* and *L. altaica* was recessive to the reflexed involucre of *L. serriola* and depended upon a single gene, *er*. The reflexed involucre of *L. virosa* and *L. saligna* was dominant in crosses with forms with erect involucres but F_1 sterility prevented study of further generations.

2365 Anderlini, R.
La fecondazione nelle "insalate".
(Fertilization in salad plants).
Sementi elette 1956 : **2** : No. 7 : 63–65.

The writer confirms that better results are obtained from cross pollination in *Cichorium endivia* than from self pollination.

2366 Belik, V. F.
(25 years of research at the Bykovo Cucurbit Research Station.)
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 6 : 8–10. [Russian].

The article, dealing mainly with agricultural methods, refers to breeding work on melons, water melons and gourds and lists varieties for each crop which will give heterotic hybrids. Among the new melons worth mention is Medovaja 1 [Honey1] (Kolhoznica [Collective Farmer] x Lastočka [Swallow]). It exceeds the ♀ parent in yield and earliness and produces fruits of equally fine quality but larger. A new gourd, Krupnoplodnaja 1 [Large-fruited 1], is notable for high yield, large fruit and drought resistance.

2367 Bohn, G. W. & Whitaker, T. W.
Muskmelon best sellers.
Seed World 1956 : **79** : No. 9 : 10, 12.

A survey of musk-melon varieties grown in the USA is given.

2368 Nazarov, S. A.
(New varieties of cucurbits).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 6 : p. 33. [Russian].

Descriptions are given of the new water melon Dynnyĭ List [Melon Leaf] and gourd Mindaljnaja 35 [Almond 35] from Birjučiĭ Kut. The former was obtained from a cross between Ažinovskiĭ 5 and a form with entire leaves. It is a midseason type outyielding all other early and midseason varieties, reaches maturity 8–10 days before Ljubimec Hutora Pjatigorska 286 [Pjatigorsk Farm Favourite 286] and produces attractive fruits of fine flavour.

The gourd Mindaljnaja 35 is stated to have been bred from a cross between an unspecified egg-plant variety and the gourd Mosoleevskaja. It is notable for high yield, earliness and high dry substance, sugar, carotene and vitamin C contents. The flavour is reminiscent of almonds. The transportability and keeping properties are good.

2369 Barham, W. S.
A study of the Royal Golden water-melon with emphasis on the inheritance of the chlorotic condition characteristic of this variety.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 487–89.

The chlorotic condition usually shown by the foliage of Royal Golden before the first fruits begin to ripen depends upon a single recessive gene (*c*). The inheritance of the resistance of Royal Golden to downy mildew was not investigated; nonchlorotic plants resistant to this disease were however found in segregating populations. The pistillate flowers of monecious varieties and of the monecious F_1 plants of crosses between such water melons and the andromonecious variety Royal Golden had vestigial stamens. The F_2 and the progeny of the F_1 plants back-crossed to Royal Golden produced many plants with both pistillate flowers containing vestigial stamens and hermaphrodite flowers with 1–3 normal stamens.

2370 Goode, M. J.
Physiologic specialization in *Colletotrichum lagenarium*.
Plant Dis. Reptr. 1956 : **40** : p. 741.

Two isolates of *C. lagenarium* have attacked the hitherto resistant water-melon varieties Charleston Gray, Fairfax and Congo.

2371 Showalter, A. M.
The inheritance of fruit shapes in *Cucurbita moschata*, var. Golden Cushaw.
Genetics 1956 : **41** : p. 660. (Abst.).

As already reported, fruit shape is governed by many pairs of alleles (cf. *PBA*, XXVI, Abst. 1861). One of the crosses between the true-breeding subvarieties obtained from a single ancestor by inbreeding and selection for 15 generations is of particular interest. The F_1 hybrids bore fruits with necks conspicuously longer than those of either parent. Back crosses to the parental subvarieties gave progenies comprising approximately equal numbers of plants similar to the F_1 and back-cross parent in neck length. This behaviour is interpreted provisionally as a case of hybrid vigour involving a single pair of genes.

2372 Shifriss, O.
Precocious differentiation in *Cucurbita pepo*.
Genetics 1956 : **41** : 659–60. (Abst.).

In the recently developed type Precocious Yellow, differentiation of the yellow colour occurs a considerable time before anthesis and is determined by *B*, whereas in ordinary varieties such differentiation takes place at anthesis or later and depends upon *Y* (cf. *PBA*, XXVI, Abst. 2903). Bicolour variation is brought about by either heterozygosity for *B* or, in *BB* individuals, by "certain gene substitutions in the rest of the pigment-controlling genotype."

2373 **(A cucumber which does not turn yellow).**
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 4 : p. 22. [Russian].

Altaĭskiĭ Skorospelyĭ 166 [Altaĭ Early 166] (Murom x Nerosimyĭ [Rain-fed]) from Novosibirsk has the same maturation date as Murom which it outyields by 10–15 c. per ha. Its transportability and flavour are good and it keeps well without turning yellow.

2374 Axelsson, F.
Gurknytt från Weibullsholm. (**Cucumber news from Weibullsholm**).
Weibulls Allehanda 1956 : No. 2 : 13–15.

The hybrid forcing cucumber Weibulls F_1 is characterized chiefly by its very early and high yield and is also attractive in appearance and resistant to *Corynespora melonis.*

2375 Ito, H. & Saito, T.
(Studies on the conditions controlling the differentiation of female, male and hermaphrodite cucumber flowers. III. The effect of growth substances on growth and sex determination of the flowers. I.)
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1956 : **25** : 101–10. [Japanese].

Male-flower formation was retarded and female-flower formation accelerated by 2,4-D, β-indoleacetic acid and α-naphthaleneacetic acid.

2376 Shifriss, O. & Galun, E.
Sex expression in the cucumber.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 479–86.

In investigations on monecious types at the Weizmann Institute of Science, Rehovot, Israel, it was found that the number of nodes from the cotyledons to the node bearing the first pistillate flower on the main stem is a constant varietal characteristic under a given set of conditions. This number provides a criterion of both sex tendency and earliness of maturity; the lower the node number the higher the tendency towards femaleness and the earlier the variety.

2377 Andeweg, J. M.
The breeding of scab-resistant frame cucumbers in the Netherlands.
Euphytica, Wageningen 1956 : 5: 185–95; Meded. Inst. Vered. TuinbGewass. 1956 : No. 85.

The pollination, propagating and testing techniques employed at the Wageningen Institute of Horticultural Plant Breeding, Netherlands, in breeding cucumbers for resistance to *Cladosporium cucumerinum* are described. Crosses between the scab-resistant outdoor cucumber Highmoor, which has short fruits and a rough mottled skin, and the susceptible frame varieties Lange Groene Broei [Long Green Frame] and Eminent, which have long uniformly green smooth fruits, indicated that scab resistance, long fruits and the skin characters of Highmoor were dominant, scab resistance being determined by a single gene. A promising hothouse or frame variety, Esvier, with scab resistance, has been developed from Highmoor x Lange Groene Broei back crossed once to the latter parent.

2378 Sinclair, J. B. & Walker, J. C.
Assays for resistance to cucumber mosaic in the pickling cucumber.
Phytopathology 1956 : **46** : 519–22.

In tests conducted at Madison, Wis., field-resistant varieties proved susceptible to inoculation with cucumber mosaic when grown under greenhouse conditions. They differed little in reaction from susceptible varieties at greenhouse temperatures of 16° and 20° C. but were slightly more resistant at 24° and 28° C., the difference between susceptible and resistant varieties being greater in spring and summer than in winter. The percentage of mottled fruits was found to be the most reliable criterion of resistance. In view of the small differences between susceptible and resistant varieties even under optimum conditions, it is suggested that greenhouse assays be used only to supplement field tests.

2379 Hitchborn, J. H.
The effect of temperature on infection with strains of cucumber mosaic virus.
Ann. appl. Biol. 1956 : **44** : 590–98.

Strains of cucumber-mosaic virus differed in ability to multiply *in vivo* at 37° C. Strains of the virus forming small necrotic local lesions in leaves of the French bean Canadian Wonder produced much lower numbers of lesions in plants kept after inoculation for 24 hours at

25° C. and then at 15° C. than in plants kept continuously at the lower temperature.

2380 De Smedt, A.
Rassenproef op tomaten in openlucht (1955). [**Variety trial of tomatoes in the open air** (1955)].
Tuinbouwber., Leuven 1956 : **20** : 6–7.

Information on the yield, earliness, vigour, shape and quality of the fruit and on disease resistance is presented for six varieties tested in Flanders, Belgium, in 1955. Moneymaker gave the best all-round results in respect of yield and quality of the fruit.

2381 Singh, H. B. & Bhagchandani, P. M.
Pusa Ruby is the new tomato with fine points.
Indian Fmg. 1956 : **6** : No. **7** : 28–29.

The above variety, developed at the Indian Agricultural Research Institute, New Delhi, from a cross between Improved Meeruti and Sioux, is described as being of medium size and good flavour, giving a yield at least equal to its parents at New Delhi. It ripens early when grown as an autumn crop and is moderately resistant to virus diseases.

2382 Kużdowicz, A.
Wyniki doświadczeń szklarniowych i polowych nad zastosowaniem mieszanin pyłku dla wywołania heterozji u pomidorów. (**The results of greenhouse and field experiments on the use of pollen mixtures in producing heterosis in tomato**).
Acta agrobot., Warszawa 1954 : **2** : 109–35.

In studies of the F_1 hybrids produced through pollination with a single variety (single hybrids) and pollination with a mixture of several varieties (mixed hybrids), both types of hybrid gave higher yields than the commercial parental varieties. The single hybrids gave the earliest yields under greenhouse conditions but were not superior to the parental varieties in the field. The differences in performance between the single and mixed hybrid progenies were slight and since pollination with single varieties gives more easily reproducible results, this method is recommended for the exploitation of heterosis.

2383 Georgieva, R.
(**The effect of pollen of distant species upon the quality of interspecific tomato hybrids**).
Izv. Inst. Rasten., Sofija 1955 : No. **3** : 55–74. [Bulgarian].

Hybrids between *Lycopersicon pimpinellifolium* and *L. esculentum* bred in the ordinary way at the Bulgarian Plant Institute gave an F_1 characterized mainly by early maturity and small fruits liable to splitting.
Changes were obtained with regard to fruit characteristics and maturation dates when the seed parent was supplementarily fertilized by the pollen of *Cyphomandra*. In this case the F_1 was vigorous and produced large firm-skinned fruits. These ripened considerably later than the first mentioned hybrids. Similar changes occurred in interspecific hybrids, where one or both components had, previous to crossing, been grafted on *Cyphomandra* stocks, and were intensified when supplementary pollination was combined with grafting. However some F_1 plants obtained by the latter method were sterile.

2384 Snyder, R. J.
The inheritance of seed weight in the tomato.
Abstr. doct. Diss. Pa. St. Univ. 1955 (1956) : **18** : 326–28.

A study of the inheritance of seed weight was made in a cross between *Lycopersicon pimpinellifolium* 'Saipan', which has small seeds, and *L. esculentum* 'Pennorange', which is large-seeded. Inbred, back-cross and hybrid seed populations were produced on each of the parental lines and back-cross and F_2 seed populations on the reciprocal hybrids. The following results were obtained: (1) seed weight is quantitatively inherited, (2) a large number of factors are involved in the expression of seed weight, some being located on chromosomes III, V, and VII, but no cytoplasmic factors are concerned, (3) the effect of these factors is additive, the only expression of heterosis being in early yield of the hybrids and not in total yield, (4) the Saipan inbred is homozygous and the Pennorange inbred heterozygous for seed size factors, (5) larger early yields are associated with medium seed size in Saipan and large seeds in Pennorange but total yield in inbreds and hybrids shows no such association and (6) small seeds of the normally large-seeded Pennorange inbred exhibit low percentage germination but no association between germination and seed size is found in any of the other lines.

2385 Butler, L. & Chang, L. O.
Graft-relationships of the anthocyanin mutants of the tomato.
Genetics 1956 : **41** : p. 636. (Abst.).

In grafts of the green-stem mutants *a*, *al*, *ag* and *aw* with the purple-stemmed wild type as stock or scion, the stem colour of the wild type did not extend beyond the graft junction.

Chromatograms of both the wild and mutant types showed four spots, the anthocyanidin present being tentatively identified as pelargonidin. Disparities in the R^f values of some of the spots offer a possible basis for the chemical identification of the mutants. Under conditions of phosphate deficiency, the leaves and stems of the wild type become intensely purple whereas in the mutants the stems and leaves remained green, except in the case of the leaves of the *ag* type, which turned purple.

2386 Lesley, J. W. & Lesley, M. M.
Effect of seed treatments with X-ray and phosphorus 32 on tomato plants of first, second, and third generations.
Genetics 1956 : **41** : 575–88.

Exposure of wet seeds of inbred tomatoes to X rays at 10,000 r. resulted in meiotic abnormalities and in reduced fertility in the first generation and the appearance of a few mutants in the second, including a single-gene mutant resembling the mutant wiry (*w*). Plants from seeds treated in the dry state appeared to be mostly normal.

Similar cytological aberrations and reduced fertility were observed when seeds were soaked in a solution containing P^{32}. In addition, P^{32} treatment induced somatic changes in the treated generation, including a high proportion of variegation, and a number of mutations which appeared in the second generation. These included some chlorophyll mutants, the gene mutations *r* (yellow) and *t* (tangerine) governing the flesh colour of the fruit and a number of other mutants of undetermined genetic nature.

2387 Mertens, T. R. & Burdick, A. B.
The use of X-irradiation to produce mutations in a polygenic system.
Genetics 1956 : **41** : p. 653. (Abst.).

It has been previously postulated that dominant genes are involved in the expression of heterosis with respect to earliness of maturity (cf. *PBA*, XXV, Abst. 604). Experiments were therefore carried out to determine whether dominant factors with a beneficial effect upon growth could be induced by X irradiation. Seeds of autodiploid or inbred tomato lines were irradiated and the plants raised from them were back-crossed to controls. Earliness was evaluated by the criteria of number of days to the first flower on the first inflorescence, the first flower on the second inflorescence and the first ripe fruit. Two back-cross lines, respectively derived from an inbred of Red Cherry and autodiploid of *Lycopersicon pimpinellifolium*, were particularly early. These lines represented two out of the 65 treated plants, the doses received being 6,000 r. and 48,000 r. respectively.

2388 Czu, D.-M. [Tsu, T.-M.]
(Some questions of vegetative hybridization).
Agrobiologija (Agrobiology) 1956 : No. 3 : 129–30. [Russian].

In experiments at Peking, a yellow-fruited form of tomato was grafted on a red-fruited stock and the first seed generation again on the same red-fruited stock. Among the seed progeny of the latter 40% bore red fruits, whereas the F_0 and the first seed generation of the first graft had only yellow fruits. By grafting an eggplant variety upon another different with regard to fruit shape and colour, heritable changes were obtained. The changes occurring in graft hybrids, from components at the same stage of development, were only in respect of shape. By grafting young scions upon mature stocks the effects of stock upon scion were intensified and the progeny segregated in respect of shape and colour of the fruit.

2389 Glavinič [Glavinić], R.
(Vegetative hybridization between tomato and tobacco).
Priroda (Nature), Leningrad 1956 : No. 11 : 98–100. [Russian].

Heritable changes in the vegetative hybrids of tomato/tobacco and tobacco/tomato, now in the fifth seed generation, are reported from Belgrade. In the case of tomato/tobacco changes occurred in respect of fruit shape, number of locules, leaf colour and the biochemical properties of the leaves and fruits. The progeny of the reciprocal was characterized mainly by great differences in leaf shape and colour and a reduced nicotine content of the leaves.

2390 Artemjev, G. V.
(The culture of vegetables under electric light in arctic regions).
Priroda (Nature), Leningrad 1956 : No. 9 : 100–03. [Russian].

Mention is made of the vegetative hybrid Budennyĭ 318 tomato/*Solanum nigrum*, notable for high yield when grown under artificial light in the Krasnojarsk territory. The second seed generation outyields Budennyĭ 318 by 130–135%.

2391 McMahon, R. M.
Mitosis in polyploid somatic cells of *Lycopersicon esculentum* Mill.
Caryologia 1956 : 8 : 250–56.

Descriptions are given of tetraploid and octoploid divisions occurring in the endodermis, cortical parenchyma and collenchyma of the third internode following treatment of this region of the stem with 2,4-D for 48 hours. Except in the collenchyma, diploid cells were also observed in all these tissues. Treatment for 24 hours only stimulated division but did not induce polyploidy.

2392 ÅKESSON, H.
Tomatförsöken på Weibullsholm.
(Tomato trials at Weibullsholm).
Weibulls Allehanda 1956 : No. 2 : 17–20.

The commercial variety Immuna/56 has been equalled or outyielded by Patrik x a mutant, several lines from Bonita x Patrik and a new F_1 hybrid, all of which were distinguished by very high early yields and high total yields.

2393 HAFEN, L. & STEVENSON, E. C.
The relationship of temperature, method of pollination, and male sterility to the time required for producing hybrid tomato seed.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 355–60.

Various methods of applying fresh and stored pollen to male-sterile and fertile plants under outdoor conditions were investigated at Purdue University, using Garden State and a mutant (sl_2) of this variety with vestigial anthers. The male-sterile form gave a higher percentage of fruit set, required less time for hand pollination and yielded more seeds per fruit than the normal variety. The most economical method of producing hybrid seed consisted of application of fresh or stored pollen with an ink-blackened matchstick to the male-sterile flowers at day temperatures below 85° F. The pollen was collected by means of an electric pollinator. It is suggested that a recessive seedling marker should be incorporated in the mutant stock so that selfs may be rogued.

2394 POLLACK, B. L. & LARSON, R. E.
Factors affecting embryo size, and the influence of embryo size on germination, time to maturity, and productivity in F_2 generation tomatoes.
Bull. Pa. agric. Exp. Sta. 1955 : No. 606 : Pp. 34.

In fruits from F_1 hybrids of Rutgers x Pritchard, the weight of the F_2 seeds varied significantly with the length of time to maturity of the fruit and with the number of seeds per fruit, but not with the weight of fruit. Size of fruit increased with number of seeds while size of seed decreased. When environmental factors affecting F_2 seed size had been reduced to a minimum, plants grown from the heavier seeds produced the first ripe fruits earlier than those from the lighter seeds and tended to bear larger fruits. An association existed between large F_2 seeds and early total yield and, within groups of seeds having the same weight, between number of days to germination and early total yield. Plants from F_1 and F_2 seeds produced the first ripe fruit earlier than either parent but were exceeded in early yield by Rutgers; fruits from F_1 plants were significantly larger than those from the F_2 or parent plants.

2395 SENJUŠKIN, A. E.
(New small-fruited tomato varieties for combine harvesting).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 7 : 18–21. [Russian].

Hybrids G326, G32673–1/10–1, G326/3–1/11–2, G326/3–1/16–3 and G325/1–4/2–2 were bred at the Majak Breeding Station. All are dwarf determinate outdoor canning varieties suitable for combine harvesting. They have small plum-shaped fruits which ripen uniformly and equal Humbert in quality. The fruits of G326/3–1/16–3 and G325/1–4/2–2 are yellow; those of the others are red.

2396 DASKALOV, H., MURTAZOV, T. & ĬORDANOV, M.
(The results of tomato breeding in the mountains).
Izv. Inst. Rasten., Sofija 1955 : No. **3** : 31–39. [Bulgarian].

New tomato varieties, notable for tolerance of low temperatures and early maturity, have been bred in the Sredna Gora mountains, 1200 m. above sea level. All have determinate and compact habits and are progenies from the cross 10 x Bison.

2397 DAY, P. R., JENKINS, J. E. E. & WILCOX, H. J.
A search for resistance to *Didymella lycopersici* in the tomato.
Plant Path. 1956 : **5** : 150–51.

None of the lines of *Lycopersicon esculentum*, *L. pimpinellifolium* and other species tested at Anstey Hall, Cambridge, England, was resistant to wound inoculation with *D. lycopersici*. It is therefore unlikely that the apparent resistance of a line of *L. glandulosum* and a line of *L. hirsutum* to soil inoculation would be of practical value in breeding.

2398 RICHARDSON, R. W. (JUN.).
Cotaxtla-1. Una nueva variedad de jitomate para las llanuras de Veracruz. (**Cotaxtla-1. A new variety of tomato for the Veracruz plains**).
Foll. Divulg. Secretaría Agric. Ganad., Méx. 1956 : No. 21 : Pp. 17.

The variety described originated as a variant of the variety Hurff's Perfection. It ripens ten days before Rutgers, is more erect in growth and less susceptible to attack by *Cladosporium fulvum*; it yields well even under windy conditions which cause severe damage to other varieties. The fruits are regular in form and free from cracks when grown under irrigation.

2399 HOUSSNY, H. H. & OTEIFA, B. A.
Preliminary field tests for evaluating some tomato varieties for resistance to root-knot nematodes, *Meloidogyne* spp.
Plant Dis. Reptr. 1956 : **40** : 974–76.

Field trials have been carried out at Giza, in Egypt, with a view to testing the reaction of 13 tomato varieties to *Meloidogyne javanica*, *M. hapla*, *M. incognita* and *M. incognita* var. *acrita*. Pearl Harbour was highly resistant to all four species and Urbana and Illinois T.19 were tolerant to *M. incognita* and *M. incognita* var. *acrita* but moderately susceptible to *M. javanica* and *M. hapla*.

2400 WALTER, J. M.
Hereditary resistance to tobacco-mosaic virus in tomato.
Phytopathology 1956 : **46** : 513–16.

This is a full version of the short report summarized in *PBA*, XXVI, Abst. 2113.

2401 WALTER, J. M.
Combination of resistances to tobacco-etch and tobacco-mosaic viruses in tomato breeding stocks.
Phytopathology 1956 : **46** : 517–19.

A summary of a brief report of this work appeared in *PBA*, XXVI, Abst. 2114.

2402 JOSHI, A. B. & HARDAS, M. W.
Alloploid nature of okra, *Abelmoschus esculentus* (L.) Moench.
Nature, Lond. 1956 : **178** : p. 1190.

In investigations at the Indian Agricultural Research Institute, New Delhi, the most frequent association observed in the sterile F_1 hybrids between *Hibiscus* (= *Abelmoschus*) *esculentus* ($2n = 130$) and *H. tuberculatus* ($2n = 58$) consisted of $29_{\text{II}} + 36$, suggesting that the haploid complement of *H. esculentus* contains one genome with 29 chromosomes and another with 36, the former being homologous with the haploid set in *H. tuberculatus*. It is therefore postulated that *H. esculentus* arose through hybridization of one species with $n = 29$ and another with $n = 36$, followed by doubling of the chromosome number. Examination of the literature suggests that *H. tuberculatus* is the only species so far found with $2n = 58$. It is noted that the sterile F_1 hybrid of *H. ficulneus* ($n = 36$) x *H. tuberculatus* formed 0–7_{II}, with an average of $1{\cdot}63_{\text{II}}$ per cell. The synthesis of a form with $n = 65$ is being attempted.

2403 HORNSEY, S.
The effect of X-irradiation on the length of the mitotic cycle in *Vicia faba* roots.
Exp. Cell Res. 1956 : **11** : 340–45.

The length of the mitotic cycle in root-tip cells of *Vicia faba* three days after X-irradiation is the same as that of unirradiated roots.

2404 TSCHERMAK-WOESS, E. & DOLEŽAL, R.
Der Formwechsel des Heterochromatins im Verlauf der Mitose von *Vicia faba*. (**Alternation in the form of the heterochromatin in the course of mitosis in *V. faba***).
Öst. bot. Z. 1956 : **103** : 457–68.

The results of studies at the Botanical Institute of the University of Vienna on changes in the structure of the heterochromatin during mitosis and in the amount of heterochromatin present at different stages of mitosis in the root-tip cells of *V. faba* are reported. During interphase the heterochromatin formed large compact bodies and staining with acetocarmine indicated that considerably more heterochromatin than euchromatin was present. The chromocentres disintegrated at the inception of mitosis and the resultant fragments, in the form of heterochromomeres, dispersed evenly throughout the nucleus. The heterochromomeres then coalesced at early prophase. During prophase the amount of heterochromatin present remained fairly constant whereas that of euchromatin gradually increased with the result that, by the end of prophase, the nucleus contained approximately equal amounts of heterochromatin and euchromatin. During prometaphase the chromosomes formed long, irregular groups and heterochromatin again became predominant. The observations appear to suggest that the heterochromatin undergoes two cycles of reduction in amount followed by an increase but it is considered more probable that apparent reductions in the amount of heterochromatin present are due to the amount of heterochromatin remaining stable at the inception of mitosis and during prophase while the amount of euchromatin increases considerably at these periods.

2405 THERMAN, E.
Dedifferentiation and differentiation of cells in crown gall of *Vicia faba.*
Caryologia 1956 : **8** : 325–48.

The cytological development of crown-gall tissue in stems of *V. faba* after inoculation with *Agrobacterium tumefaciens* is described in detail. The stimulation of both normal mitosis and endomitosis in the differentiated cells of the stem tissues is ascribed to the excessive production of growth substances by the gall. Few fragments or other mitotic irregularities were seen.

2406 **X-ray methods yield new bean.**
What's New Crops Soils 1956 : **9** : No. 2 : p. 23.

Sanilac, a new bush-type bean variety which is resistant to the α strain of *Colletotrichum lindemuthianum* is described. It matures earlier, gives higher yields and is more tolerant of humid conditions than Michelite. It was developed from anthracnose-resistant strains crossed with a selection from the progeny of X-irradiated seed of Michelite.

2407 HONMA, S.
A bean interspecific hybrid.
J. Hered. 1956 : **47** : 217–20.

Four F_1 plants obtained from a cross between *Phaseolus vulgaris* ♀ and the blight-resistant species *Ph. acutifolius* resembled the former parent in both vegetative and floral characters. The hybrids were self fertile and observations on root-tip mitosis indicated that the chromosome complements of the two parents, both with $2n = 22$, did not differ morphologically. F_3 data provided evidence of quantitative inheritance of blight reaction, seed size and leaf dimensions.

2408 SQUIBBS, F. L.
A description of some dwarf French bean varieties.
J. nat. Inst. agric. Bot. 1956 : **7** : 639–48.

A key is included for the identification of 47 dwarf French bean varieties, 19 of which are described.

2409 ROSS, E., BREKKE, J. E. & MOORE, J. F.
The objective evaluation of some green bean varieties used for processing in the northwest.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 398–411.

Varieties of the Blue Lake type, grown in the Puyallup area of Washington State, were evaluated with respect to suitability for canning and freezing on the basis of fibre content and tough string of the canned beans, straightness of the fresh beans and the colour of fresh, frozen and canned samples as indicated by spectrophotometric analysis of acetone extracts and by measurements obtained with the Hunter color meter. Variety was among the factors affecting fibre content, tough string and colour.

2410 BOCANEGRA S., S.
Resistencia a las enfermedades del frijol más comunes en la Costa Central. (**Resistance to the diseases of the French bean most common in the central coastal area**).
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 347 : 25–28. (Mimeographed).

In experiments with 78 Peruvian varieties and 55 from other countries of South and Central America, only one of the Peruvian varieties and 22 from elsewhere displayed resistance to *Heterodera marioni*; 37 of the Peruvian varieties were resistant to *Erysiphe polygoni* as compared with 8 of those from abroad.

2411 ŠEVČUK, T. N.
(**Local *Phaseolus* varieties from Transcarpathia**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 10 : 14–18. [Russian].

The collections of leguminous crops from Transcarpathia at the Institute of Plant Industry include forms of *Phaseolus vulgaris* and *Ph. multiflorus* distinguished by high yield, large seed and resistance to *Colletotrichum* and *Pseudomonas*. Some are bush beans, others climbing and all have a protein content of 22·62% or over.

2412 YERKS, W. D. (JUN.) & TELIZ ORTIZ, M.
New races of *Colletotrichum lindemuthianum* in Mexico.
Phytopathology 1956 : **46** : 564–67.

When tested on five Mexican and three United States differential bean varieties, some 30 collections of *S. lindemuthianum* from Mexico fell into 11 classes, ten of them distinct from the three previously known races α, β and γ and one identical with β. In an incompletely analysed experiment, an F_6 progeny, whose parents Amarillo 154 [Yellow 154] and Canario 101 [Canary 101] differed in reaction to some races, was found to combine the resistance reactions of both parents, indicating that genetical control of the disease is possible.

2413 Baggett, J. R.
The inheritance of resistance to strains of bean yellow mosaic virus in the interspecific cross *Phaseolus vulgaris* x *P. coccineus*.
Plant Dis. Reptr. 1956 : **40** : 702–07.

Data from crosses of lines of *Ph. coccineus* immune from the above virus with lines of the susceptible variety Blue Lake of *Ph. vulgaris* indicated that immunity is recessive and depends upon two or three major genes. The wide and continuous F_2 variation in the expression of symptoms, ranging from the degree of susceptibility shown by Blue Lake to a symptomless condition, further suggested the presence of modifiers. The possible value of this cross in breeding for virus resistance and the problem of symptomless carriers in breeding material are discussed.

2414 Jones, S. T. & Isbell, C. L.
Selection of varieties for use as parents in the breeding of the southern pea.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 412–15.

Varieties of *Vigna sinensis* were intercrossed to determine their value as parents with respect to plant type, earliness, pod shape, pod length, number of peas per pod, pea size, vigour of root system and nematode resistance. None of the crosses gave desirable progeny as regards all the characters studied, but crosses in which Alacrowder, Alabunch, Blue Goose, Jackson 21, Alalong and Conch figured as parents produced progeny combining several of the required characters; the cross Alabunch x Jackson 21 showed desirability in the greatest number of characters, viz. growth type, root system, pod shape, pod length and pea size. Conch imparted a suitable root system and nematode resistance in all crosses.

2415 Miyasaka, S.
Melhoramento da soja. I. Observações preliminares sôbre o comportamento de algumas variedades de soja em São Paulo. (**Breeding soya bean. I. Preliminary observations on the behaviour of some varieties of soya bean in São Paulo**).
Bragantia 1954 : **14** : 9–17.

Most of the varieties introduced into Brazil from the USA and elsewhere proved inferior to varieties already acclimatized, such as Abura which was however surpassed in yield by the commercial Brazilian varieties Nova Granada, Pereira Barreto and IA455. Two new varieties, Aliança [Alliance] and Aliança Preta [Black Aliança] proved promising, with yields of 3000 kg. per ha. Palmetto had the lowest nematode attack and CNS the lowest infection by *Xanthomonas phaseoli*. The varieties with the highest protein content were Aliança Preta, Yelnando, Abura and Cotia 14. Attempts to cross *Glycine ussuriensis* and *G. javanica* with cultivated soya beans were unsuccessful.

2416 Carter, J. L.
Twenty years of cooperative research.
Soybean Dig. 1956 : **16** : No. 11 : 61–64.

The article includes an account of soya-bean breeding carried out by the US Regional Soybean Laboratory in cooperation with state agricultural experiment stations. Varieties resulting from this programme are described. Mention is made of investigations on the induction of mutations by X and thermal-neutron irradiation; the work includes the search for mutants resistant to diseases.

2417 Minkevič, I. A.
(**Soya bean, a forage plant with high protein and oil contents**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. **10** : 15–17. [Russian].

New varieties, adapted to cultivation in northern districts of Russia and Siberia, have been bred at Habarovsk and the Amur Breeding Station. They are productive of forage and pods, show resistance to drought, have a short growth period and an oil content of up to 23%.

2418 **Seed bulletin. Peas and fieldbeans.**
IVRO, Wageningen 1956 : Pp. 10.

Brief descriptions are given of the principal varieties of blue peas, marrowfats, yellow peas and field beans recommended for cultivation in the Netherlands in 1956.

2419 Lamm, R.
Localization of *Gp* and *R* in *Pisum*.
Hereditas, Lund 1956 : **42** : 520–21.

The types Extra Rapid N and Tibet 7 contain reciprocal translocations involving chromosomes 1 and 3 but the positions of the breaks are different in the two stocks. The following order of points of interchange and genes has been established: T(1–3)b–*Gp*–T(1–3)a–*R* for chromosome 1 and T(1–3)b–*St*–*B*–T(1–3)a for chromosome 3. T(1–3)a and T(1–3)b designate the points of interchange in Tibet 7 and Extra Rapid N respectively. The centromere of chromosome 1 may be situated between T(1–3)b and *Gp*.

2420 Kapucijners en rozijnerwten, 1957. **(Dun peas and maple peas, 1957).**
Landbouwvoorlichting 13 : Bijl. 20; Ber. Rassenkeuze 1956 : No. 217 : unpaginated.

Data on yield, growth habit, suitability for mechanical harvesting, disease resistance, size of pea and nutritive value are presented for the principal varieties of dun and maple peas grown in the Netherlands.

2421 Ronde groene erwten, 1957. **(Round blue peas, 1957).**
Landbouwvoorlichting 13 : Bijl. 18; Ber. Rassenkeuze 1956 : No. 215 : unpaginated.

Data on yield, quality, disease resistance and suitability for certain types of soil are presented for seven established and two new varieties tested in the Netherlands in 1956.

2422 Schokkers, 1957. **(Marrowfats, 1957).**
Landbouwvoorlichting 13 : Bijl. 19; Ber. Rassenkeuze 1956 : No. 216 : unpaginated.

Brief descriptions are given of the principal varieties of marrowfats grown in the Netherlands, together with tabulated data on their performances in yield trials in 1956.

2423 VEENBAAS, A.
Verslag van het kwaliteitsonderzoek van kapucijner- en rozijnerwtenrassen (oogst 1954 en 1955). [**Report on research into the quality of dun and maple pea varieties (1954 and 1955 crops)**].
Gestencil. Meded. cent. Inst. LandbKund. Onderz., Wageningen 1956 : No. 12 : Pp. 28. (Mimeographed).

Data are provided on the cooking quality of the principal varieties of dun and maple peas grown in the Netherlands (cf. *PBA*, XXVI, Abst. 1910). The dun pea varieties Aureool [Halo] and Dolfijn [Dolfin] and the maple pea varieties Ivora and Koroza proved superior.

2424 UNGER, K.
Zum Einfluss der klimatischen Standortfaktoren auf die Blühzeit und den Blühverlauf einiger Gemüseerbsensorten. **(On the influence of regional climatic factors on time and course of flowering in some varieties of garden pea).**
Z. Acker- u. PflBau. 1956 : **102** : 69–80.

The temperature and photoperiodic requirements of a number of varieties grown in the open at different centres were determined. Temperature was considerably more important than photoperiod in determining time taken to reach the flowering stage and varietal differences in reaction to different sowing times and temperatures were observed. In general, temperatures above 15° C. accelerated flowering and temperatures below 15° C. inhibited it.

2425 CHAUDHARI, B. B.
Tiny seed and tiny pod segregates in Bengal gram (*Cicer arietinum*).
Curr. Sci. 1956 : **25** : 330–32.

At the Agricultural Research Station, Niphad, two segregates from White flower white grain III x Chafa were found to possess smaller leaves, pods and seeds than either parent. Data on segregation in the F_2 and F_3 generations indicate that the small seed and pod character is recessive and monogenic.

2426 KAJJARI, N. B.
A new mutation in *Cajanus cajan* Millsp.
Curr. Sci. 1956 : **25** : p. 333.

A mutant possessing obcordate leaves, keel petals united at the top and two or three apocarpous ovaries was found at the Agricultural Research Station, Annigeri, in 1953 and has bred true in the two subsequent years. No cytological differences between this mutant and normal plants have been found and both have the chromosome number $2n = 22$.

2427 LACHMAN, W. H.
Corn breeding in Massachusetts.
Bull. Mass. agric. Exp. Sta. 1956 : No. 488 : Pp. 26.

The work of the Massachusetts Experiment Station in developing good-quality, early-maturing F_1 hybrid sweet corn is briefly reviewed. The hybrids Gold Mine, Golden Beauty, Golden Jewel, Barbecue and Pilgrim, which have been released within the last few years, are described, together with a new experimental hybrid, Ma53.17 (Ma21547–1–1 x NI1437), which will probably be introduced in the near future. It grows up to seven feet tall, with few tillers, and shows little tendency to lodge. The ears are large and the kernel flavour is good. It is resistant to *Xanthomonas stewarti*. Four inbreds are also described: Ma32, from a segregating back-cross of (P39 x C4) x P39; Ma2410–191, from Gill's Golden Early Market; Ma2412–2 from Will's Golden Gem and Ma21547–1–1 which is derived from a single plant selection from Me2. The use of male-sterile inbreds in the production of agronomically desirable hybrids is also discussed.

2428 LANA, E. P.
Effects of plant population and seasons on the performance of sweet corn for canning.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 460–67.

The hybrids Goldencross, Iochief and Iogreen 56 were grown at the Iowa Agricultural Experiment Station at different rates of planting for three seasons during the 1951–53, data being collected on number of days to silking, weights of unhusked and husked corn per acre, weight per acre of corn cut from the cobs, percentage of cut corn, number of ears per plant and weight per ear. The effects of year and hybrid were significant for each of the seven determinations. Rate of planting was noteworthy for its effect upon maturity, sowings at the lowest rate (2 plants per hill) being 5 days earlier than those at the highest (6 plants per hill). Interaction of hybrid x year was significant only in the case of ear weight. Rate of planting x year interactions were significant for weights of unhusked, husked and cut corn. Except for percentage of cut corn, rate x hybrid interactions were not significant. Significant second-order interactions of rate x hybrid x year were found only for ear number and ear weight.

2429 HASKELL, G.
Internode patterns, adaptation and the origins of sweetcorn.
Genetica 1956 : **28** : 308–44.

By graphic representation of the lengths of successive internodes and the positions of the inflorescences in mature plants of North American maizes, two types of ideogram were obtained, characteristic of flint and dent varieties respectively; the ideogram types remained constant whether the plants were grown in England or Missouri. Of 33 sweet corn strains grown at Hertford, England, most gave ideograms of the flint type, some, notably strains of Evergreen, proved to be of the dent type and a few were intermediate. The three groups defined by ideogram pattern showed characteristic differences in rapidity of germination, percentage germination, date of flowering and numbers of tillers, ears and internodes. It is suggested that the gene su_1 determining sugary endosperm has arisen independently in both flint and dent maizes and that the two types have tended to remain separate because of differences in flowering time. Flint types of sweet corn were better adapted than dent to English conditions, being hardier and earlier and having better germinating capacity.

2430 THOMAS, W. I. & JOHNSON, I. J.
Inheritance of pollen restoration and transmission of cytoplasmic sterility in popcorn.
Agron. J. 1956 : **48** : 472–74.

Back-cross and F_2 data from crosses involving the pollen-restoring line Tx127C indicated that the restoration of pollen production in most popcorn lines carrying Tx203 cytoplasmic male sterility was determined by a single dominant gene. In crosses with the popcorn inbred 28, however, marked deviations from monogenic segregation ratios were obtained. In a second pollen-restoring line, K55, the gene for pollen restoration appeared to be allelic to that in Tx127C. On back crossing lines carrying a pollen-restoring gene together with male-sterile cytoplasm to normal inbred pollen parents, material heterozygous for the pollen-restoring gene segregated for male fertility and could thus be identified. Except in one cross, pollen from such heterozygous material showed the same staining capacity as normal inbreds.

Of 78 popcorn lines tested, one was as effective as Tx127C and K55 in restoring fertility. Preliminary data suggest that in this line, too, a simple gene for pollen restoration is involved.

2431 BEMIS, W. P. & HUELSEN, W. A.
Maturity in relation to popping expansion of popcorn.
Proc. Amer. Soc. hort. Sci. 1956 : **67** : 451–59.

The relation between the moisture contents of the cob and kernel of the hybrids Iopop 6 and Purdue 202 was similar, although the hybrids matured at different rates. Popping expansion and dry weight per kernel were closely related. The maximum popping expansion of both hybrids was reached when the moisture content of the kernel was 30–35%.

2432 **New mints resist rust.**
What's New Crops Soils 1956 : **9** : No. 3 : p. 21.

Progress in breeding rust-resistant varieties of *Mentha piperita* is reported by Oregon State College. Two of the 27 varieties tested under field conditions since 1954 have proved superior to Mitcham in herb and oil tests and were ten days earlier.

BOOK REVIEWS

SNEDECOR, G. W.
Statistical methods.
Iowa State College Press, Ames, Iowa 1956 : 5th Ed. : $7.50 : Pp. xiii + 534 : tables.

The fifth edition of this well-known book differs from earlier editions (cf. *PBA*, Vol. XVI, p. 361) in the following particulars: (1) the material on factorial experiments has been augmented and placed in a separate chapter; (2) the emphasis has been shifted from significance testing to interval estimation; (3) some nonparametric tests have been included; (4) an additional chapter on Design and analysis of samplings has been added by W. G. Cochran; (5) changes in style and notation have been incorporated at many places. The result is to make a good book even better, and to keep it up-to-date in respect of statistical ideas applicable to agriculture and biology. The book still retains its excellent collection of exercises drawn from practical work and its very clear layout of computational procedures. The short course advocated by the author makes it suitable for beginners, whilst the extra material is valuable for more experienced workers. D. V. L.

GODWIN, H.
The history of the British flora.
Cambridge University Press, London 1956 : 90s. : Pp. viii + 384 : 119 figs. : 26 plates : 1 table.

Either evolution is history or it is nothing at all. Geneticists, who tend to approach evolution via mathematical extrapolation from breeding data, are liable to obtain a picture of evolution that only corresponds indifferently to the facts of the fossil record. Dr. Godwin's *History of the British Flora* is written for a much wider public than plant geneticists and breeders but the vast corpus of data he provides on the distribution in space and time of British plants goes far towards laying down a factual basis on which theories on the evolution of British wild and cultivated plants can be established.

As stated in the preface, the present volume is the outcome of some twenty-five years' research by the author and his colleagues on the floristic history of Great Britain during the Quaternary era. After a short introductory chapter, an outline of the technique of collecting and identifying plant remains is given. Recent studies of pollen morphology under oil-immersion objectives have extended the possibilities of discrimination between pollen grains down to the specific level. Nevertheless, identification is frequently difficult and Dr. Godwin indicates many of the worst snags; highly suspicious identifications, such as the number of reports of horse-chestnut charcoal in archeological sites, are duly pointed out.

In chapter III, the chronological background of the Quaternary era and the accompanying geological and climatic changes are described. Many different types of evidence are reviewed in these connexions, including the indications provided by bog stratigraphy, faunal characteristics, archeological remains, radiocarbon dating and pollen analysis.

The greater part of the volume is occupied by chapter V, which is a fossil flora of the British Isles; it is preceded by a brief chapter on recorded sites. The flora is arranged on the system of the *London Catalogue of British Plants*; for each species or species group, a comprehensive series of published records is given, with information on the location of the site, its vice-county, the nature of the plant remains, e.g. seeds, charcoal or pollen, and the date. General observations on history, distribution and ecology follow and numerous ancillary diagrams are included.

The following chapter reviews the floristic history of the British isles, including a brief account of Tertiary floras. Of particular interest here is the account of the Interglacial floras. While certainty has not yet been obtained, there appear to be strong indications that some, at least, of the Interglacial periods can be distinguished by their floras; thus *Abies* pollen is abundant in the Clacton Interglacial while *Carpinus* pollen dominates the later Histon Road Interglacial. Another point that emerges in this chapter is the native status of many agricultural weeds which occur long before Neolithic agricultural operations.

Many of the records in the fossil flora relate to economic species. A very full account is given of cereal remains, based largely on the work of Jessen and Helbaek. Other economic crops mentioned are flax, fruits (well represented in Roman archeological sites), forest trees, peas and broad beans.

In addition to being a monumental repository of facts, Dr. Godwin's book achieves high distinction for its botanical prose in which clarity of exposition is associated with quite uncommon command of style. There are numerous line drawings and photographs. The key to timber anatomy stated to face p. 12 is inserted at the end of the volume.

KÜSTER, E.
Die Pflanzenzelle. (**The plant cell**).
Gustav Fischer Verlag, Jena 1956 : DM 54 : Pp. xxii + 986 : 489 figs.

This is a text book on cytology in the broadest sense, compiled in the classical tradition of the German school, being the basis of a series of lectures or *Vorlesungen* delivered by the late Professor Ernst Küster at the University of Giessen. It has been completed by his widow in collaboration with Professor K. Höfler.

The first part comprises a very full description of the properties of protoplasm in both healthy and diseased cells, the second describes the nucleus and includes discussions of mitosis and meiosis and the many factors that affect them; questions of polyploidy and nuclear fusion are also treated in this section. Plastids, starch grains, crystals and other inclusions are dealt with in the next two chapters; there follow chapters devoted to vacuoles and the cell membrane and the final chapter deals with the development of the cell: the factors that influence growth and division, shown to be largely independent, are considered, as are the factors affecting cell form and the manifold variety of the forms resulting; different modes of cell division are described and problems concerned with differentiation, conjugation and regeneration are examined. A brief final chapter points to some developments to be expected in cytology from the application of modern techniques.

There are full author and subject indexes and each chapter is supplied with an extensive bibliography in which the literature of the earlier half of the 20th and the late 19th century is more fully covered than that of the post-war period, few titles bearing dates much later than 1950. The presentation is of the expected high order of excellence and the text is richly supplied with illustrations.

WAIN, R. L. & WIGHTMAN, F. (Editors)
The chemistry and mode of action of plant growth substances.
Butterworths Scientific Publications, London and Academic Press Inc., New York 1956 : 55s. : Pp. xi + 312 : figs. : tables.

It is a measure of the rate of development of the knowledge of plant growth substances that the international conference held in Lund, Sweden, in 1953 was so quickly followed by another, at Wye College, England, in July 1955. The proceedings of the conference, embodied in this handsome volume, make a valuable record of the varied contributions, which dealt with a wide range of aspects of a common problem, classed respectively under natural auxins, chemical structure and biological activity, metabolism and mode of action and kinetics of auxin-induced growth.

Though the practical application of growth substances has greatly outstripped the study of their chemical nature and mode of action, evidence was presented at this conference in favour of the view that indole-3-acetic acid is the "native auxin of hormonal function" and that other substances are active only after conversion to IAA; tryptophane would seem to be the primary precursor but the exact mechanism of auxin biosynthesis is not yet clearly understood. A large number of compounds that act as growth substances in greater or lesser degrees are referred to by the various contributors but the biochemical mechanism of auxin action still remains a matter for speculation; one contributor suggested that since auxins, in addition to promoting growth, also control differentiation, there may be some intimate connexion between auxin balances and nucleic acid dynamics. Similar molecular size and form has been demonstrated in substances having a similar physiological effect, though chemically they may have no close affinity; and it has been shown that (+) forms of certain compounds are active in stimulating growth while the corresponding (—) forms are inactive or have a suppressive action. Some substances stimulate cell enlargement only whereas others stimulate both division and enlargement; however, response to a simple substance such as 1 : 3-diphenylurea, now established as an active constituent of coconut milk, proves to be very different in different strains of, say, carrots. The immature fruit of the horse chestnut is found to contain growth-promoting substances as active as those of coconut milk and these have been shown to be nitrogen-free, some of them having been identified as leucoanthocyanins; others are substances with little or no chemical affinity with either diphenylurea or the leucoanthocyanins. Some modifications in molecular structure bring about an increase in physiological activity which can be ascribed simply to greater ease of penetration into the cell.

In the section on metabolism evidence is submitted which shows that IAA becomes bound to some protein present in plant cytoplasm, that its destruction by an oxidase system is probably part of the growth regulatory system, that it stimulates water uptake by reducing cell-wall pressure and that a phosphatide cycle is involved in a water-secreting system. There are suggestions that lactones such as coumarin may be intimately involved in the ability of auxins to inhibit growth and that, on entry into the plant, auxin interacts with some receptor entity of the tissue and that growth rate is proportional to the amount of complex thus formed. This latter suggestion however was subjected to a certain amount of criticism.

McLean, R. C. & Ivimey-Cook, W. R.
Textbook of theoretical botany. Vol. II.
Longmans, Green & Co., London, New York, Toronto 1956 : 90s. : Pp. xiii + 2201 : 2067 figs.

This second of four volumes ambitiously designed to provide university students with a text book which covers the whole field of botany and which bridges the gap between elementary surveys and specialist works, is concerned entirely with angiosperms. The general morphology and anatomy of angiosperms were dealt with in the first volume; this volume describes their floral morphology and reproductive behaviour and provides an introduction to their taxonomy. The first chapter gives a comprehensive account of flower structure, its variation and interpretation, the second a fairly detailed treatment of pollination mechanisms. The following two chapters describe sexual reproduction, fruit and seed structure and dispersal and seedling growth. In the five chapters forming the second half of the book, selected families are studied in some detail under their respective orders, special attention being paid to families characteristic of the British flora but reference also being made to families of general botanical interest or economic importance; the last chapter deals with the principles and history of plant classification.

As can hardly be avoided in a large-scale work of this kind, there are a number of slips. For example, a drawing of a flowering shoot labelled *Quercus petraea* on p. 1285 bears a close resemblance to *Q. robur*; in the discussions of pollination mechanism, bees are referred to as long-sighted on p. 1154 and short-sighted on p. 1261; on p. 1789 the ash of the durian fruit is said to contain up to nearly 25% sugar. But on the whole, with its clear descriptions and its excellent illustrations, all well-placed in relation to the text, the book is admirable. It is a pity that the vast majority of the diagrams and photographs carry no indication of their scale and that in some cases, especially in diagrams of flower structure, the labelling is inadequate. However, but for its price, this handsomely produced volume should certainly find favour with those for whom it is intended.

Milthorpe, F. L. (Editor)
The growth of leaves.
Butterworths Scientific Publications, London and Academic Press Inc., New York 1956 : 40s. : Pp. vii + 223 : figs. : tables.

Increased leaf area is one of the major objectives of plant breeding, most obviously in crops where the leaf is the product harvested but also in plants such as cereals where the economic product is some other organ.

The present volume is the report of the Third Easter School of Agricultural Science, held at the University of Nottingham in 1956, and comprises 14 papers on various aspects of the physiology of leaf growth and differentiation. With the exception of Professor Bünning of Tübingen, all the contributors are from institutes in Great Britain.

The paper of major interest to plant breeders is that by D. J. Watson on Leaf growth in relation to crop yield, in which it is maintained that leaf area is a more important breeding objective than photosynthetic rate. Other papers of special interest are the opening paper by F. C. Gregory on General aspects of leaf growth; E. Bünning on General processes of differentiation; W. T. Williams on Etiolation phenomena and leaf expansion, which includes a vigorous criticism of the concept of the leaf as a unitary morphological category; and F. L. Milthorpe, The relative importance of the different stages of leaf growth in determining the resultant area, in which leaf area as a yield component is analysed further in respect of the effect of temperature during the various stages of plant development.

For plant breeders, the most striking omission in the symposium is any paper on the genetics of leaf development such as J. B. Hutchinson has contributed for cotton.

Wilson, A.
The altitudinal range of British plants.
T. Buncle & Co. Ltd., Arbroath 1956 : 2nd. Ed. : 10s. 6d. : Pp. 117.

The first edition of this small book appeared in supplements to the *North Western Naturalist* in 1930–31 and was published as a separate volume in 1931. Now issued in a revised and enlarged edition, it forms a useful reference work in which records of altitudes at which plant species have been found in the British Isles are collected. The main body of the work, which does not claim to be exhaustive, consists of a list of British vascular plants following, with few exceptions, the sequence and nomenclature given in the *Check List of British Vascular Plants*; the entry under each species gives (*a*) its normal altitudinal range in the British Isles, three levels being recognized, viz. sea level (below 50 ft.), lowland (50–1000 ft.) and upland (above 1000 ft.); and (*b*) individual records, many of them made by the author, of altitudes at which it has been found in England, Wales, Scotland and Ireland.

The work is prefaced by a short essay on the edaphic, climatic and human factors influencing altitudinal distribution, special attention being given to the effects of rainfall and temperature on the mountain flora in different parts of the British Isles. Much work, however, remains to be done in this field, and this book provides data which will certainly be of value for further studies.

International code of botanical nomenclature.
International Bureau for Plant Taxonomy and Nomenclature, Utrecht 1956 : Pp. 338; also in French, German and Spanish.

The latest version of the International Code of Botanical Nomenclature is based on the decisions of the Nomenclature Section of the VIIIth International Botanical Congress held in Paris in 1954. While similar in substance to the preceding Stockholm Code, the arrangement has been considerably modified and the articles renumbered. There are now three official versions of the rules, in English, French and German respectively. All of these, together with an unofficial Spanish version, are included in the present publication.

The preamble and principles now precede the rules. The latter consist of 75 articles. There are five appendices dealing respectively with the nomenclature of hybrids, fossils, *nomina generica conservanda*, determination of types and bibliographical citation.

It is obviously impossible to examine the various changes made in the latest code in detail. The following points, however, are of some general interest. Art. 29 lays down that effective publication of a new name is not achieved by mention in a tradesman's catalogue or non-scientific newspaper, even if a Latin diagnosis is given. The type system is advanced further, Art. 35 insisting that, after 1 Jan. 1958, indication of a type is a prerequisite for valid publication.

The new code persists in treating Latin as a mumbo jumbo rather than a language. Thus we are instructed to write *Pinus sylvestris* but *Genista silvestris*. There is also an inconsistent classical snobbery lurking behind. We are led to suppose that Julius Caesar would prefer *silvestris* to *sylvestris* though this term has a different connotation in botanical Latin to what it had in classical Latin. Yet, had Julius Caesar extended his operations further east, we would not expect him to transcribe the names of the chieftains he encountered in such guises as the Antipoviczius and Juzepczukius recommended by the present code.

The older codes treated hybrids as moral lapses. The present version betters their status but does not dispose of all the problems attending their nomenclature. It seems to be assumed that the systematist must decide whether or not a plant is a hybrid. In the case of sterile plants with efficient means of vegetative reproduction this may not be possible. Amphidiploids are not even mentioned. A distinction also seems to be drawn in Art. 28 between wild and cultivated species; the status of escapes is not clarified though their taxonomy, as in cotton, may be intricate and of some economic significance.

HERMANN, F.
Flora von Nord- und Mitteleuropa. (**Flora of northern and central Europe**).
Gustav Fischer Verlag, Stuttgart 1956 : DM 98 : Pp. xi + 1154.

This useful compendium covers the spermatophyte and pteridophyte flora of most of Europe north of the Mediterranean region. The area treated extends as far as Scandinavia, Iceland and Spitzbergen on the north, the British Isles and central France on the west, the Alps and the Hungarian plain on the south and Poland on the east.

Keys are provided to the families, genera and species; the specific diagnoses are incorporated in the species keys. The latter are followed by descriptions of the ecological habitat and geographical distribution, both within the area treated and beyond, of each species. Vernacular names in German, English and the Scandinavian languages are also given.

While deliberately eschewing microspecies, this flora contains an immense amount of floristic information and should prove a valuable source of reference both for botanical explorers and armchair systematists.

DUNGAN, G. H. & ROSS, W. A.
Growing field crops.
McGraw-Hill Book Company, Inc., New York, Toronto & London 1957 : 37s. : Pp. xii + 495 : figs. : tables.

This book is a primer on the cultivation of field crops for experienced and would-be farmers in the United States. As the authors write in the preface: "Sentences are short. The approach is practical". A particularly good feature is the arrangement of the subject matter, which has been treated in strict chronological order according to the way the farmer needs to plan his undertaking and also according to the successive steps in the development of the crops themselves. Thus, after an introduction on How field crops grow and develop, the opening chapters deal with the choice of suitable crops and varieties, the purchase of good seed, seed treatment, soil preparation, seed sowing and transplanting, obtaining suitable stands and subsequent cultivation. The chapters following are concerned with control of weeds, insects and diseases, harvesting, storage, marketing, breeding and maintenance of varietal purity, and lastly, keeping crop records. A glossary of terms and good index are included. A list of films is also provided but no references to useful literature are cited. The chapter on breeding will give anyone approaching the subject for the first time a fairly adequate picture of the scope of breeding and of the methods usually employed. Although occasionally the book suffers from the faults likely to be found in any exposition at an elementary level, the authors have succeeded in their main objective of providing the American farmer and agricultural student with a reliable and as far as possible nontechnical introduction to crop production.

LEVITT, J.
The hardiness of plants. Agronomy : 6.
Academic Press Inc., New York & London 1956 : $7.00 : Pp. viii + 278 : 37 figs. : 128 tables.

The sixth of this handsome series of monographs prepared under the auspices of the American Society of Agronomy (cf. p. 164 above) is devoted to what the author terms hardiness, defined as the "ability to survive the full impact of the unfavorable environment without any protective barrier", as opposed to resistance, which is viewed as a capacity to escape the impact. Contrary to what many might be led to expect from its title therefore the book deals with "hardiness" to low temperature, drought, heat and miscellaneous factors. It differs from many reviews of this kind in that it surveys the early literature of the subject, including that of the 18th and 19th centuries and sometimes earlier, as fully as the more recent contributions. The reason for this is that many techniques have not changed greatly, the workers of the old school are sometimes accounted more accurate in their methods and observations and some of the fields of investigation they studied have not been covered by modern investigators. Where the earlier results do not accord with more recent findings this is of course pointed out and a very comprehensive survey results, from which some interesting points emerge. Thus all protoplasm, we learn, is able to survive the lowest temperatures under suitable conditions: only hydrated protoplasm can be injured by low temperatures. Practically nothing is known as to the causes of injury by chilling without freezing. Measurements of hardiness by different authors are not comparable and a standard definition of frost hardiness of an organism is required; the one proposed is "the number of degrees (°C.) below its freezing point at which it must be frozen in order to produce 50% killing". Physiologists are warned of the complexity of the problem, since hardiness may depend on the action of two or more genetic factors. There is a frequent correlation between small cell-size and frost hardiness though many exceptions have also been noted. Frost hardiness apparently has a protoplasmal component, associated with the bound water, which reduces the injury by mechanical stresses during freezing, and a vacuolar component, associated with the degree of cell contraction. Some plants owe their hardiness to a lowering of the freezing point, some to a tolerance of dehydration, some to both. Thus one of the main factors in frost hardiness, namely tolerance of dehydration, is common also to drought hardiness and the two are frequently found to be parallel; heat hardiness is also often parallel and seems to be conditioned by the same group of factors but the final words of the author are that "there is no evidence and no *a priori* reason for expecting that other kinds of hardiness are also included". The volume ends with a bibliography covering over 40 pages, a feature of which is the inclusion, in an uncommonly accurate form, of many references to German, Russian and other European work as well as that published in the English language.

Annual Review of Entomology. Vol. 2.
Annual Reviews, Inc., Palo Alto, California, 1957 : $7.50 : Pp. 407 : figs. : tables.

Most plant geneticists will feel at home in parts at least of this volume of the *Annual Reviews*. The cytogenetics of *Drosophila* have been so important for the development of genetical principles that this insect has been almost adopted by the plant geneticist, at least until the recent rise of fungal genetics as a worthy competitor. The complexities of chromosomal behavior in the insects have been the fascination and despair of most biologists who are not entomologists, and, we suspect, of many who are; they are admirably reviewed by M. J. D. White in Cytogenetics and systematic entomology, who believes that the general effect of cytological studies will be "to increase still further the number of instances of sibling species barely or not at all distinguishable on external characters"—not, as we had ingenuously hoped, to reduce the number of species. In Genetics of insect resistance to chemicals, J. F. Crow discusses a topic that is equally close to the hearts of plant breeders and microbiologists; the reviewer maintains that all the evidence supports the view that insecticide resistance is an evolutionary change, a selective rather than adaptive phenomenon, resistance being "entirely attributable to chromosomal genes", though resistance may be genetically different in different strains. R. H. Bennett writes on the behaviour of systemic insecticides applied to plants and G. E. Hohart on Pollination of alfalfa and red clover, the main insect species responsible for tripping and pollination of these two plants in different localities being analysed.

EDMOND, J. B., MUSSER, A. M. & ANDREWS, F. S.
Fundamentals of horticulture.
McGraw-Hill Book Company, Inc., New York, Toronto & London 1957 : 2nd Ed. : 50s. 6d. : Pp. xiii + 456 : 149 figs. : 30 tables.

On first looking through this book the reader receives the impression that the field covered by the authors is so wide that their treatment of it must of necessity be rather superficial, in spite of the claim implied by the title, and unfortunately this impression is confirmed on closer examination. It is assumed by the authors that the book will be studied in class and supplemented by discussion with the teacher. Such supplementation will clearly be needed on a large scale since one repeatedly comes across technical terms used without explanation, e.g. micropyle, embryosac and endosperm on p. 38 and node, internode, monocotyledon, dicotyledon and others throughout the book, or important subjects disposed of in a few sentences, e.g. the reference to the growing of resistant varieties on p. 264. It will also be necessary for the teacher to correct such statements as "An individual stamen consists of a stalk called the filament and a pollen sac called an anther" (p. 32) and "A fungus, called mycorrhiza, is associated with the roots" (p. 319). The book is illustrated both by photographs, which are of a high standard, and by diagrams, which are unfortunately of a much lower standard, without indication of scale or adequate labelling.

Regarded as the framework of a horticultural course this book could be of considerable use but it is clear that the authors have undertaken too much in their attempt to "cover the fundamentals of plant growth in general botany" and "present a well balanced view of the entire field of horticulture". Readers of *Plant Breeding Abstracts* in particular will be saddened to learn that the study of genetics is apparently not considered to be fundamental.

KURTH, H.
Vom Wildgewächs zur Kulturpflanzensorte. (**From wild plants to cultivated crop variety**).
Die neue Brehm-Bücherei, Wittenberg 1957 : DM 8 : Pp. 142 : 65 figs. : 27 tables.

The declared objects of this volume are firstly to trace the evolution of cultivated plants from their wild ancestors to their present forms and secondly to review the work of modern plant breeders and to discuss the results they have achieved during the course of the past few decades. The opening chapters deal with the basic principles of plant reproduction, the gene theory and the laws of heredity, the influence of environment, Vavilov's theory of gene centres, and the roles played by mutation, natural selection, geographical isolation and natural hybridization. The author then goes on to discuss the part taken by man, from prehistoric times onwards, in guiding the evolution of crop plants from their original wild forms and the way in which some of the more important crop plants, such as maize, soya bean and the potato, have spread throughout the world from their primary centres of origin. A special section is then devoted to the importance of certain crop plants, e.g. rubber, cotton, flax, sugar cane and sugar beet, to world economy. The final chapters deal with recent advances in plant breeding, with special reference to the development of the sweet lupin, the exploitation of hybrid vigour in maize, interspecific and intergeneric hybridization and the induction of mutations and polyploidy. Practical problems that arise in plant breeding and seed production are also mentioned. A bibliography of some 400 works, a comprehensive glossary and subject and author indexes complete the volume. Encompassing as it does all the basic facts about plant breeding and the evolution of plants, this book can be recommended to anyone interested in the subject who possesses a knowledge of German. It is written in an interesting, conversational style and introduces explanations of genetical principles informally at relevant points without resorting to a bald recitation of Mendelian laws and statistical ratios. The tables and diagrams are presented in a competent manner and contribute considerably to an understanding of the text.

Cobley, L. S.
An introduction to the botany of tropical crops.
Longmans, Green & Co., London 1956 : 37s. 6d. : Pp. xv + 357 : 66 figs. : 82 plates.

Students of tropical agriculture will warmly welcome this interesting and informative book, which is the outcome of the author's fourteen years' experience in various parts of the tropics. Having spent nine of these years as lecturer in tropical crop botany he is well qualified to provide the type of book which will be most useful for students. However it is by no means merely a text book and the general reader also will find much to interest him. All the most important crops and many of those of minor importance are dealt with, not only those grown for export but also "back garden" crops grown for home consumption. Tropical forage and fodder crops are, however, omitted, since the author feels that an adequate treatment of them would require a separate volume. Owing to limitations of space many crops which are as yet of only local importance have also had to be omitted, as have descriptions of the internal anatomy of the crop plants in most cases. Nevertheless we are left with an extensive survey covering cereals, sugar cane, vegetable fibres, oil seeds, pulses, starch plants, spices, beverage and drug plants, fruits, vegetables, rubber and essential-oil crops. Each chapter is provided with a list of references and at the end of the book suggestions for further general reading are given, together with an index of botanical names and a general index.

It is unfortunate that this book, in spite of the great interest of its subject matter, is less readable than it should be owing to lapses of style and grammar. The text figures and photographs are of excellent quality but no reference is made to them in the text. This is more serious as regards the photographs since it has not always been possible to place them near the description of the crop which they illustrate. Their usefulness in many cases would have been enhanced by some indication of scale and one would like to have seen more photographs of unfamiliar crops and fewer of the familiar ones. The text figures, drawn by the author, are very clear, though not always well labelled, and on p. 115 the transverse and longitudinal sections of the fruit of *Ricinus communis* have become interchanged.

Nevertheless the author has given us an adequate survey of a vast and still expanding subject and the book should be of value to anyone concerned with, or merely interested in, tropical crops.

Hellwig, W.
Das Leben der Pflanze I. (**Plant life I**).
Die neue Brehm-Bücherei, Wittenberg 1956 : DM 3 : Pp. 56 : 32 figs.

The object of this short handbook is to acquaint the layman with the ways in which plants obtain the raw materials necessary for their growth. It is divided into six sections, devoted respectively to the carbon cycle in plants and animals, plant metabolism, catabolism, saprophytic and parasitic plants, symbiosis and insectivorous plants. Useful features are the detailed descriptions given of laboratory equipment employed in determining chemical processes taking place in the living plant tissue and the discussion of the roles played by enzymes and bacteria. The whole is written in a clear, factual style and provides a useful addition to the series of which it forms part.

Dickson, J. G.
Diseases of field crops.
McGraw-Hill Book Company, Inc., New York, Toronto, London 1956 : 2nd Ed. : 64s. : Pp. xi + 517 : 102 figs. : 14 tables.

All who have had occasion to use the first edition of this work, reviewed in *PBA*, XVIII, p. 182, will be aware of its value as a text book and work of reference and will welcome a new and larger edition which has all the merits of its predecessor. The treatment and arrangement are the same but a considerable amount of new material has been incorporated. The section on legumes contains two additional chapters, one on groundnut diseases, the other on diseases of legume crops not discussed in the preceding chapters. Other chapters are expanded to include diseases not dealt with in the earlier work or to give more detailed treatment to certain parts; the virus diseases in particular are discussed in greater detail. There are also many new illustrations, replacing or supplementing the earlier ones, and the photographic reproduction has been much improved.

In conclusion, it need only be said that in no way is the present work inferior to the old edition: in lucidity, method of presentation and attention to detail the new fully equals the old: in size and comprehensiveness, and hence in general usefulness, it is superior.

MEREDITH, D. (Editor)
The grasses and pastures of South Africa.
Central News Agency Ltd., Johannesburg and L. Reeves & Co., Brook, Kent 1955 : 63s. : Pp. xvi + 771 : 493 figs. : 32 plates : tables : 1 map.

In the foreword he wrote in 1950 for this book, the late General Smuts emphasized the richness of the grass resources of South Africa and the wide opportunity of botanical discovery and economic exploitation they offer. In Part I, all the indigenous and some introduced grasses growing in the Union and South West Africa are described for the first time in a single work by L. K. A. Chippindall. Species known to occur in Bechuanaland also receive attention but, as it is pointed out, available records from that country are few and incomplete. The book is intended not only for specialists but also for nonexperts, and the introductory sections on the general principles of classification of grasses, the botanical features of the grass plant and practical instructions on identification competently equip beginners with the information essential for making good use of Part I as a guide to the tribes, genera and species in the regions in question. No attempt has been made to offer complete descriptions such as are to be found in monographs and the standard floras, references to which are conveniently listed at the end of each of the sections on the tribes. The intention has been instead to provide brief descriptions which are concentrated upon features necessary or helpful in identification. The black and white drawings and coloured plates made by Miss G. E. Lawrence and others to illustrate many of the species provide an attractive and clearly delineated accompaniment to the well-written descriptive notes. In addition, 83 distribution maps are included. Part 2 contains 14 chapters, each of which has been compiled by one or more of seventeen authors. Chapter 1 gives an account of Grasslands in South African agriculture. Chapter 2 is made up of two contributions: (*a*) The ecology of grasslands by A. W. Bayer and (*b*) the chromosome numbers of some indigenous South African and introduced Gramineae by R. de V. Pienaar. After a popular account of general cytological behaviour, chapter 2 (*b*) draws attention to polyploidy as an evolutionary factor and as a means of developing improved forms, and gives a useful list of the somatic chromosome numbers reported in the world literature for species found in South Africa. It is however difficult to see why these two contributions, unlike any of the others, were juxtaposed in this special way, since no relationship is established between the results of any ecological and cytogenetical investigations. The next six chapters are concerned with the chemistry and physiology of grasses, principles of pasture management, veld management in the dry, summer-rainfall bushveld, the role of fertilizers in pasture management, pasture plants for special purposes and the establishment of indigenous grasses from seed. The remaining chapters deal with the preservation and utilization of grassland products, the grass ley in South Africa, the recuperation of soils under grass pastures, grasses in soil and water conservation, grasses for sporting purposes, parks and aerodromes, and botanical survey in South Africa (illustrated by three coloured maps). A glossary and separate indexes to Parts 1 and 2 and to common names round off the book, which is in fact two very useful books in one.

CARDOZIER, V. R.
Growing cotton.
McGraw-Hill Book Company, Inc., New York, Toronto and London 1957 : 43s. 6d. : Pp. xxi + 423 : figs. : tables : plates.

Like *Growing Field Crops* by G. H. Dungan and W. A. Ross, also reviewed in this issue of *Plant Breeding Abstracts*, *Growing Cotton* is a volume in the McGraw-Hill Rural Activities Series which is primarily intended to supply information, in as far as possible nontechnical language, to farmers and prospective farmers in the United States. In the opening chapter, the economic and agricultural factors which the farmer should consider in deciding whether or not to grow cotton at all, or in determining the acreage to be taken up by this crop, are analysed very thoroughly. Chapter 2 gives guidance on the choice of variety, followed by an account of the general methods used by the breeder in developing an improved variety. The next activities dealt with are the production, purchase and processing of the seed, choice of land and soil preparation, selection of fertilizers, application of fertilizers, and planting and spacing. Chapters on weed control, irrigation, control of parasitic and nonparasitic diseases, insect control, defoliation and harvesting complete the know-how of production up to the time the crop is taken from the fields. The remaining chapters give the farmer the knowledge he requires concerning ginning, grading and marketing. An appendix provides statistics on world production and various other items of information. The numerous photographs have been well chosen. For its particular purpose, the book could not be bettered and it should find interested readers outside the United States.

HAARER, A. E.
Modern coffee production.
Leonard Hill [Books] Limited, London 1956 : 56s. : Pp. xiv + 467 : 36 figs. : tables : 75 plates.

A book about coffee usually makes interesting reading and the present volume is no exception. In the first chapter a full and often picturesque account is given of the introduction of coffee from its original Ethiopian home to the countries of the East and later to the New World, whence it was introduced once more to Kenya, Nyasaland and other African territories. It is shown that most of the coffee that moved about the world was derived from two original strains, the type species *Coffea arabica* var. *arabica* and the strain introduced by the French into the island of Réunion at Bourbon, which has come to be known as *C. arabica* var. *bourbon*; from these two strains many mutants and local variations have later arisen. In discussing the complexities of the systematics of the genus *Coffea*, the author suggests that all the coffees grown commercially can be assigned to the species *C. arabica*, *C. canephora*, *C. liberica* and *C. excelsa*, *C. robusta* being regarded as a form of *C. canephora*. A full account is given of these four species and their forms, and of a number of species of lesser economic importance, some from Africa and some from Asia.

In chapter III the author emphasizes the importance of a knowledge of the genetics and cytology of a genus for its improvement by breeding methods and gives an outline of what is known on these subjects from the published literature on coffee; special reference is made to the work carried out by Krug and others in Brazil at the Institute of Agronomy at Campinas, all of which will be familiar to readers of *Plant Breeding Abstracts*. The importance of Kent's coffee from India in making it possible to grow Arabian coffees in areas infected with leaf rust and other diseases receives particular mention. Conditions of environment suitable to different types of coffee are examined in the next two chapters, and in chapter VI, devoted to propagation from seed and the factors that should be taken into consideration in selecting mother trees, emphasis is laid on the importance of the environment in determining whether a given strain of coffee will do well or not in any given locality; in this chapter brief outlines are given of practical breeding work that has been carried out in Africa, India, Java and elsewhere; methods of raising seedlings are also described, questions of vegetative reproduction being discussed in the following chapter. Care and maintenance of coffee plantations, harvesting and preparation are next dealt with and there follow two chapters devoted respectively to diseases and pests of coffee. The remainder of the book is concerned with the statistics and economics of production.

The volume is well and copiously illustrated and each chapter is provided with a selected list of works for further reading.

Tuinbouwgids 1957. (**Horticultural guide, 1957**).
Uitgave der Directie van de Tuinbouw, Den Haag 1957 : f. 6 : Pp. xvi + 802 : figs. : tables : plates.

The current edition of this valuable reference book for horticulturalists is the fourteenth of its kind and, once more, it has been thoroughly revised and enlarged, the number of pages having been increased from 764 in the previous edition (cf. *PBA*, XXVI, p. 335) to over 800. Sections are included on the varieties of fruit, vegetables, tobacco and ornamental plants cultivated in the Netherlands, the market garden industry, control of diseases and insect pests, irrigation and the use of fertilizers. Comprehensive statistics are also provided on meteorological conditions and the market gardening and fruit industries. Indexes at the end of the book provide ready access to the wide range of information covered and foreign readers will find the glossary with its English, German, French and Swedish equivalents of Dutch terms to be of considerable assistance.

8e beschrijvende rassenlijst voor fruitgewassen, 1957. (**Eighth descriptive list of fruit crops, 1957**).
Inst. Vered. Tuinbouwgewassen, Wageningen 1957 : f. 1.75 : Pp. 137 : figs. : tables.

The eighth edition of this useful publication brings up to date the list of fruit varieties at present being grown in the Netherlands. Particular attention is paid to pome and stone fruits, including the question of suitable rootstocks, but the principal varieties of small fruits, nuts, figs, grapes, quince, medlar and mulberry are also described in detail. In addition to established varieties, promising strains and selections that may be important in future receive mention. Reference to the comprehensive and detailed information contained in the book is facilitated by an excellent index.

Fruit tree raising.
Ministry of Agriculture, Fisheries and Food, London 1956 : 3rd Ed. : Bull. No. 135 : 5s. : Pp. vi + 50 : 6 figs. : 29 plates.

The third edition of this bulletin, which first appeared in 1946, provides the nurseryman with up-to-date information on apple, pear, plum and cherry rootstocks available in Great Britain and their vegetative propagation. It contains chapters on the following: commercial rootstocks and their uses; recognition of rootstocks; rootstock raising; budding and grafting; double-working and the use of stem builders and staddles; pruning and shaping; standard trees for orchards on the mixed farm; control of pests and bacterial and fungal diseases; and the problems due to virus diseases. Drawings illustrating some of the methods described and many photographs facilitating identification supplement the text. An important feature of the revised edition is the inclusion of information on some members of the new Malling-Merton series of apple rootstocks. Released in 1952 and bred jointly by the East Malling Research Station and John Innes Horticultural Institution, they are resistant to woolly aphid.

Farbtafeln der Apfelsorten. (**Colour plates of apple varieties**).
Eugen Ulmer, Stuttgart 1956 : DM 10.80 : Pp. 112 : 50 figs. : 50 plates.

The object of the volume under review is to assist in accurate varietal identification and to provide information as to the soil and climatic conditions to which each variety is best suited. A separate sheet, containing technical data and a diagram of a cross-section of the fruit, is devoted to each variety and has facing it a coloured plate illustrating the morphological characteristics of the fruit. The technical data provided include information on the growth habit of the tree, size, shape, flavour, keeping properties and transportability of the fruit, colour of the skin and length of the stalk, fertility and suitability as a pollinator for other varieties, winter hardiness and susceptibility to diseases and woolly aphis, type of soil to which the variety is best suited and the merits of each variety from the market point of view. Of the fifty dessert varieties so described, the great majority are of German origin and are not commonly grown outside Germany but descriptions of a few Dutch and English apples, such as Boskoop and Laxton's Superb, are included. The work, which contains an index to the varieties described, is well produced and should prove extremely useful to fruit growers and those concerned with the marketing of apples in Germany.

KÖSTLER, J. & ANDERSON, M. L. (Translator)
Silviculture.
Oliver & Boyd, Edinburgh and London 1956 : 45s. : Pp. xvi + 416 : 81 tables : 20 plates.

The breeding of forest trees is one of the most specialized branches of plant breeding owing to the highly divergent techniques of agriculture and sylviculture. The days when forest-tree breeding and sylviculture were seen as conflicting means of woodland improvement are now happily passing but the necessity for the tree breeder to remain alive and responsive to sylvicultural methods remains.

The present volume is a translation from Professor Köstler's *Waldbau* and provides a good insight into the German school of sylviculture, which owes many of its salient characteristics to the work of Gayer in Bavaria at the end of the last century. The function of sylviculture is regarded as the maintenance and improvement of forests and the ensuring of a satisfactory annual timber yield. Sylvicultural techniques that lead to immediate economic returns but eventual deterioration are condemned and there is a tendency to deprecate the more "unnatural" types of forest with single species and uniform age groups.

The first part of the book deals with biological principles such as insolation, water supply, edaphic factors and growth rhythm. Heredity and provenance races are discussed briefly. The salient sylvicultural characteristics of the main indigenous and introduced Central European tree species are reviewed, and forest structure and forest-tree communities are treated along the rather artificial lines popularized by Braun-Blanquet.

Part two is concerned with sylvicultural methods. The selection forest, thinning, lopping, regeneration, felling methods and reafforestation are treated in considerable detail.

Some readers might object to the vitalist aura which pervades the book though on such issues as Möller's concept of the *Dauerwald*, the forest regarded as an enduring organism, the author expresses himself with restraint and moderation. The general style of exposition is involved and the literal character of the translation is responsible for some additional obscurity. English readers should bear in mind that much of what Professor Köstler says relates to Central European conditions only and does not apply elsewhere. The translation of tree names is unsatisfactory. *Tilia platyphylla* and *T. cordata* are termed summer and winter linden respectively; the usual English usage is large and small-leaved lime. *Ulmus glabra*, usually termed the wych elm and not infrequent in English lowlands, is termed the mountain elm and, most misleading of all, *U. carpinifolia* (= *U. campestris*) is called the English elm, a name long reserved for *U. procera*, which is not known at all as a native on the European mainland.

> Fortschritte des forstlichen Saatgutwesens. (**Progress in forest-seed production**).
> J. D. Sauerländer's Verlag, Frankfurt am Main 1956 : DM 11 : Pp. 117 : figs. : tables.

The drying-kiln for forest seeds at Wolfgang in Hessen was founded 130 years ago and has furnished seed of guaranteed origin and quality to large sections of central and northern Germany ever since. In this volume issued to celebrate the anniversary, emphasis is placed on the importance of provenance in several of the articles contributed by recognized authorities on the subject of forest-tree seed. The contribution of most direct interest to plant breeders is the following.

> *Rossmässler, W. Die Bedeutung der hessischen Standortrassen für die Beschaffung einwandfreien Forstsaatgutes.* (*The importance of the local Hessen races for the production of reliable forest seeds*). (*pp. 11–16*).

Seed from the famous pine forests of the Rhine-Main basins has given excellent results when planted in many other areas, but only if they are below 300 m. in altitude and have an average temperature of 15–16° C. during the growing season. Other good types referred to are the highland pine, suitable for altitudes of 200–500 m., a high-yielding subtype of this known as the Buntsandstein pine, the Schiffenberg lowland pine suitable for altitudes of 0–300 m. and the Odenwald highland pine from Lörzenbach.

Other valuable local types that receive mention are spruces resistant to red rot, the well-known larch from Schlitz, Douglas firs tolerant of *Rhabdocline* or resistant to it, Weymouth pines with partial resistance to blister rust and with high yielding abilities and superior forms of *Quercus pedunculata*, beech, Japanese larch and many other forest trees.

Various questions of seed production, testing and storage are treated in the other contributions.

> 9e beschrijvende rassenlijst voor groentegewassen (inclusief vroege aardappel, aardbei, tabak, geneeskrachtige en aromatische kruiden). [**Ninth descriptive variety list of vegetables (including early potatoes, strawberries, tobacco, and medicinal and aromatic herbs**)].
> Inst. Vered. Tuinbouwgewassen, Wageningen 1957 : f. 1.75 : Pp. 164 : figs. : tables.

The latest edition of the above reference book (cf. *PBA*, XXVI, p. 335) maintains the high standard set by previous issues and should prove of considerable value to farmers and market gardeners. The different crops are arranged in alphabetical order and the principal varieties of each are described briefly and succinctly. Information on diseases and disease resistance is also given. Selections included in the list of vegetables are accompanied by the name of the producer in order that users may know where the better selections are to be obtained and reference to any particular variety is facilitated by a comprehensive index at the end of the book. The section on peas and beans, which includes information on the suitability of a number of varieties for canning and preserving, is of particular interest.

> GOTTSCHALK, W.
> Die Cytologie der Kulturtomate und ihrer wildwachsenden Verwandten. (**The cytology of the cultivated tomato and its wild-growing relatives**).
> Martinus Nijhoff, Den Haag; B. T. Batsford Ltd., London : 1956 : 24s. : Pp. 109 : 21 figs. : 13 tables.

The author of the work under review is well known both in Germany and abroad for his research on the cytogenetics of the genus *Lycopersicon*; his avowed object in this book is to summarize the results of recent studies by himself and others on the cytology of the cultivated tomato and its wild relatives and to pass in review outstanding problems in this field. The amount of literature on the cytology and genetics of the tomato is considerable and sometimes contradictory and this attempt at a synthesis would thus appear both timely and welcome.

The initial section gives a simple outline of the systematics of *Lycopersicon* spp. and discusses the relationship of the different species to one another. Later, in a section devoted to current problems in tomato genetics, the author returns to the wild species and discusses their crossability with cultivated varieties and their potential value as a means of introducing genes for early maturity and resistance to frost and diseases into *L. esculentum.*

A section on mitosis and meiosis in diploid and tetraploid tomatoes is then followed by a list of those chromosomes that have been identified and by a study of meiotic irregularities in various mutants of *L. esculentum* and in triploid and aneuploid forms. It is noted that the size of the cell and its components is related to chromosome number and the possible effect of cell size on fertility is discussed, with special reference to tetraploid tomatoes. Views held by different authors on the basic chromosome number of the genus *Lycopersicon* are also outlined and it is concluded that it is more likely to be 6 than 12.

The results of research on endomitosis and cytological behaviour in differentiated tissues are then summarized and an account is given of the occurrence of spontaneous mutations and their induction by irradiation or chemical treatment. The value of haploids for producing homozygous diploids and tetraploids by colchicine treatment is mentioned, as is also the induction of polyploidy by different methods, including colchicine treatment, decapitation and infection with *Bacterium tumefaciens.* The section on the cytology of periclinal chimeras and burdos is also of considerable interest. The final section is devoted exclusively to the cytology of wild species and their hybrids.

This objective and succinct study is supplemented by a bibliography of nearly 200 works.

NEW JOURNALS

Albrecht-Thaer-Archiv

This new journal, the first number of which appeared in June 1956, is published by the Faculty of Agriculture and Horticulture of the Humboldt University, Berlin. Intended to maintain contact between the technical and theoretical sides of agricultural and horticultural research, it will deal mainly with experimental research carried out at the Humboldt University, although specialists from other German universities will be invited to contribute to future issues. The first number includes articles on the production of growth-promoting and growth-inhibiting substances by germinating seeds, the use of labour-saving machines in the cultivation of the sugar beet, factors affecting milk yield in cows and the development of strains of bacteria resistant to penicillin (cf. Abst. 1104). Correspondence should be addressed to the Akademie-Verlag GmbH, Berlin W8, Mohrenstr. 39.

Genen en Phaenen. (*Genes and Phenes*).

This new monthly journal, the official organ of the Netherlands Genetical Association, is intended to replace *Erfelijkheid in Praktijk* [*Practical Heredity*], which ceased publication a short while ago. Its main task will be to maintain contact between the practical and theoretical sides of genetical research and keep research workers in touch with developments outside their own immediate field of activity. The first issue, which appeared in July 1956, contains the inaugural speech given by Professor M. J. Heuts on the occasion of the first meeting of the Benelux Genetical Congress in Utrecht in September 1955 (cf. Abst. 1166); later issues include further papers of interest on practical and theoretical aspects of genetical research (cf. Absts. 1014 and 1052). Additional information may be obtained from the editorial staff, Bremlaan 8, Wageningen, Netherlands.

Robigo

This journal, the first number of which appeared in September 1956, is the outcome of a proposal made at the Third International Wheat Rust Conference that a "Reporting Leaflet" should be published which would cover all aspects of research connected with cereal rusts. Articles are to be kept short, and are published in English and Spanish and sometimes also in German. The first number contained several reports of interest to plant breeders, which are summarized in Absts. 1625, 1627 and 1631. Further information may be obtained from the Editor, Ing. Agr. José Vallega, Instituto de Fitotecnia (Robigo), Castelar, Argentina.

INDEX

Abbott, E. V., 2028
Abdul Hameed Khan, 1981
Abdul Rashid Khan, 1567, 1577
Abdur Rashid Khan, *see* Abdul Rashid Khan
Acosta, A., 1630
Acosta V., R., 1625, 1627
Adams, M. W., 1305, 1313
Afanasiev, M. M., 2080
Afanasjeva, A. S., 1605
Akeley, V., 1935
Åkesson, H., 2392
Akhter, S. W., 1629
Alcaraz, E., 1458, 1485
Alexander, D. E., 1306
Alihanjan, S. I., 1175
Alim, A., 1818
Aljbenskiĭ, A. V., 2260
Allahverdiev, R. K., 2245
Allan, R. E., 1307
Allen, G. H., 1573
Allen, T. C. (Jun.), 1800
Allison, J. L., 1896
Alves, A., 2099
Anandaramiah, M. R., 1281
Anderlini, R., 2365
Anderson, L. F., 1127, 1161, 1853
Anderson, M. L., p. 399
Andersson, E., 2308
Andersson, G., 2119.
Andersson, H., 1674
Andeweg, J. M., 2377
Andrews, F. S., p. 395
Andrews, J. E., 1301
Angulo Carpio, M. D., 1151, 1401
Angulo, *see* Angulo Carpio
Anson, R. R., 1960
Antunes Filho, H., 1404–5, 2093–6
Appleyard, R. K., 1101
Arai, Y., 1743–5
Arceneaux, G., 2011
Archimovitsch, A., 2063
Ardnt, W. F., 1007
Argüeta, J. Merino, *see* Merino Argüeta, J.
Arias, E. Bueso, *see* Bueso Arias, E.
Arkel, G. A. v., 1014
Armstrong, J. M., 1497, 1857
Arnal, H., 2198
Arnason, T. J., 1555
Arnborg, T., 2273
Arnold, M. H., 1952
Arruda, H. Vaz de, 1000, 1686
Artemjev, G. V., 2390
Arunabha Dutta, 1147
Arun Kumar Sharma, 1140, 1144, 1802, 2338
Arutjunova, L. G., 1964
Atabekova, A. I., 1902
Atchison, A. A., 1152
Athwal, D. S., 1392, 1628, 1639
Atkin, J. D., 2332, 2350, 2353
Atkins, I. M., 1308, 1338, 1673
Atkinson, G. F., 1810
Atta Ullah Khan, M., 1567
Ausemus, E. R., 1298, 1638
Avratoščuková, N., 1528
Avtonomov, A. I., 1963
Axelsson, F., 2362, 2374
Aziz, M. A., 1765

Baba, I., 1823
Backus, M. P., 1174
Badenhuizen, N. P., 1051
Baggett, J. R., 2413
Bahteev, F. H., 1768
Bailey, W. R., 1043
Bain, R., 1649
Baines, R. C., 1487
Baker, E. P., 1670, 1799
Baldwin, H. I., 2323
Ballari, C. P., 1834, 1837
Ballatore, G. P., 1562
Banfi, A., 2176
Banga, O., 1524, 2333
Barber, S. A., 1304
Barham, W. S., 1358, 2369
Barner, H., 2273
Barnett, J. A., 1180
Barricelli, N. A., 1511–12
Barua, D. N., 2092
Baser, N., 2070
Baširov, V. B., 2238
Bateman, A. J., 1430
Bateman, K. G., 1109
Bates, J. F., 2039
Battaglia, E., 1163
Batts, C. C. V., 1552
Bauman, L. F., 1309
Bauserman, H. M., 2076
Baylor, M. B., 1016
Beard, F. H., 2108, 2111, 2115
Becker, G., 1189, 1397
Becker, G. J. F., 1541
Beddows, A. R., 1843
Bederker, V. K., 1971
Behrens, W. U., 974
Bejnar, W., 1908
Belcher, B. A., 2013
Belderok, B., 1539
Belik, V. F., 2366
Bell, G. D. H., 1579
Bemis, W. P., 2431
Beñatena, H. N., 2176
Bennekom, J. L., 2333
Bennett, J. H., 1017, 1079, 1090, 1513
Benvenuti, A., 1927
Bereaw, T. E., 2315
Bernadowski, J., 1926
Bernal, D. Mesa, *see* Mesa Bernal, D.
Bertram, G. L., 1539
Bhagchandani, P. M., 2381
Bhardwaj, S. N., 1270
Bhargava, J. C., 2057
Bhat, N. R., 1266, 1974, 2085
Bianchi, A., 1721
Binet, F. E., 1090
Bingham, R. T., 2316
Bieri, R., 1862
Bieske, G. C., 2046–7
Bilquez, A., *see* Bilquez, A.-F.
Bilquez, A.-F., 1549, 1746
Birkett, L. S., 2036
Bisoveckiĭ, T. Ja., 2067
Björkman, S. O., 1878
Blackett, G., 1649
Blackwood, M., 1732
Blakeslee, A. F., 1431
Blanco, J. L., 1436
Bliss, C. I., 976
Blumer, S., 1531
Bocanegra S., S., 2410
Boerger, A., 1459, 1486
Bohn, G. W., 2367
Bokil, S. D., 1437*b*
Bolsunov, I., 1460
Bonvicini, M., 1414–5, 1575
Bor, N. L., 1855
Borisova, L. N., 1175
Borlaug, N. E., 1630
Borries, G. von, 1702
Bose, S., 1399, 1679
Bosemark, N. O., 1866
Bourne, B. A., 2029
Bourne, C. L. C., 2036
Bouvarel, P., 2274
Bowles, A., 1478
Boyce, A. M., 2206
Boyes, J. W., 1416
Braak, J. P., 1535
Bradshaw, A. D., 1465
Breaux, R. D., 2045
Bredihina, A. I., 1966
Breese, E. L., 981
Brekke, J. E., 2409
Bresch, C., 1102
Brett, P. G. C., 2015–6
Brewbaker, J. L., 1517
Briault, P. G., 1112
Briggiler, H., 1831
Briggle, L. W., 1310
Bringhurst, R. S., 2211
Brink, R. A., 1725, 1739
Brinkerhoff, L. A., 1983
Brinkley, R. M., 1351–2
Britikov, E. A., 1168
Britton, D. M., 2213
Brock, R. D., 1169
Broekhuizen, S., 1542
Brooks, S. N., 1311
Brown, A. G. 2170
Brown, A. H., 1724
Brown, K. J., 1951
Brown, M. S., 1440
Brünig, E., 2275
Bruyère, R., 1568
Bryson, V., 1449
Buchinger, A., 1199
Buchli, M., 1656
Buchwald, N. F., 1023
Buck, P. A., 2356
Buckner, R. C., 1346
Bueso Arias, E., 1695
Buhr, H., 1530
Bukasov, S. M., 1938
Bullen, E. R., 1557
Burdick, A. B., 1510, 2387
Burger, O. J., 1343
Burgi, E., 1105
Burkholder, C. L., 2150

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